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TROPICAL DISEASES BULLETIN

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BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN

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THE TREATMENT OF SOME EYE DISEASES IN THE TROPICS

by

Lt.-Col. E. W. O'G. Kirwan, C.I.E., M.Sc., M.D., F.R.C.S.I.

The external diseases of the eye

In a tropical country eye diseases are very common and the medical officer in his daily routine work will be called upon to treat large numbers. Intense sunlight, great heat, much dust, the prevalence of flies, previous or existing disease, various forms of intoxication and avitaminosis are prominent factors in the causation of conjunctival and corneal diseases. Many of these diseases are allowed to run their course unchecked or are aggravated by harmful treatment with the result that there is an enormous amount of unnecessary blindness.

The advent of sulphonamide therapy and the antibiotics has done much to alter the course and prognosis of the acute inflammatory diseases of the eye. The antibiotics have a far wider range than the sulphonamides but the important point is to get good therapeutic results quickly by utilizing the drugs which are available. It is also of great importance to make a differential diagnosis of the different types of infection. A red eye is not necessarily evidence of infection. An eye may be congested from an attack of acute iritis or of acute or subacute glaucoma. A muco-purulent or purulent discharge from the conjunctiva is definite evidence of infection and its absence in a congested eye is proof of an inflammatory reaction rather than an infection. Specific therapy by sulphonamides or antibiotics is indicated only in an infection. A bacteriological examination of the discharge, although advisable, may not be possible and generally is of no great importance as most of the pyogenic organisms are sensitive to both penicillin and sulphonamides. If, however, within 24 hours of commencing adequate penicillin or sulphonamide therapy the infection is not well under control, it may be assumed that the infection is due to Gram-negative bacilli or other rare organisms which are insensitive to penicillin or sulphonamides.

Muco-purulent conjunctivitis

Acute muco-purulent conjunctivitis of varying severity is very common in all tropical countries especially during the summer and autumn months. The causative organisms are Koch-Weeks bacilli, gonococci, staphylococci, streptococci, pneumococci, diplobacilli and the bacilli of influenza and

diphtheria. The commonest type, which often appears in epidemic form, is due to the Koch-Weeks bacillus. It produces the classical picture of acute muco-purulent conjunctivitis popularly known as "pink eye", is very contagious and is readily spread. Both eyes are usually affected. It shows a marked tendency to spontaneous cure but is very liable to recur and so treatment must always be continued till all discharge has ceased and the eye has become white. Children's eyes, owing to the softness of the tissues, become more inflamed and swollen, with the result that corneal complications, unless they are carefully treated, are common. In some countries acute conjunctivitis presents a bigger problem than trachoma and efforts should be made to protect the eyes of children suffering from the disease and to ensure that early treatment is available and residual complications are avoided.

Treatment consists in irrigating the eyes 2–3 times a day with warm saline or warm boiled water. This is best carried out with an undine or irrigator or moist pledgets of cotton wool, rather than with an eye cup. Penicillin ointment (1,000 units of crystalline penicillin per gm.) is applied inside the conjunctival sac every 2 hours during the day. The eye should be white within 24–48 hours. The Koch-Weeks bacillus, however, is only weakly sensitive to penicillin, so that when it is found on bacteriological examination or when the conjunctivitis is not clearing up with topical penicillin within 48 hours, other drugs should be used. Instillations of 1 per cent. streptomycin twice a day have been found satisfactory in Koch-Weeks infections, although streptomycin is not a specific drug for the disease; complete cure usually occurs in 5–6 days, with no tendency to relapse. Streptomycin should be discontinued as soon as possible as it has a tendency to produce local irritation. During epidemics this is a simple and efficient method of treatment which can be carried out by a non-medical staff. If streptomycin is not available, reliance must be placed on saline irrigation and sodium sulphacetamide drops (30 per cent.) or sodium sulphacetamide ointment (6 per cent.) to be used with the same routine as penicillin. The action of penicillin locally can be reinforced by the oral use of the sulphonamides but this is seldom necessary as penicillin-sensitive organisms clear up rapidly with the use of ointment or drops. If corneal ulceration occurs, atropine sulphate (1 per cent.) drops should be instilled. The ulceration usually starts at the margin and must be treated with the greatest care.

In the treatment of conjunctivitis no bandaging of any kind should be done. The eyes can be covered by a shade or dark glasses which protect them and at the same time allow the discharge to come away.

Purulent conjunctivitis

1. *Ophthalmia neonatorum*

The gonococcus is responsible for some 20–25 per cent. of these cases, but more are caused by the staphylococcus, pneumococcus and most of the other common pyogenic organisms. Some 10–20 per cent. of cases are caused by a pyogenic virus. All the different organisms are sensitive to penicillin and sulphonamides although to a variable degree. Treatment, to be successful, must be thorough so that the relatively insensitive organisms are destroyed as well as the sensitive ones. Before treatment a swab is taken for smear and culture.

There are two methods of treatment. Penicillin locally gives rapid results but requires considerable nursing attention. As an alternative when no special facilities are available, oral administration of sulphonamides is the method of choice.

Penicillin therapy. One drop of solution (10,000 units per ml.) is instilled into the conjunctival sac every minute for 30 minutes. At the end of this time there is usually little or no discharge. Instillations of penicillin drops are continued six times at intervals of 5 minutes, followed by a similar number at intervals of half an hour, one hour and 2 hours. If the lids still remain sticky, the instillations are continued every 2 hours for a further 12 hours. Irrigations are not required, and any discharge is wiped away with moist pledgets of cotton wool. Crystalline penicillin only should be used in dispensing the drops as impure penicillin may cause an allergic reaction similar to that caused by atropine. Penicillin locally is usually sufficient to produce a cure but its value is increased by intramuscular injections (200,000 units per ml.) given every 3 hours or combined with each administration of the sulphonamides.

Sulphonamide therapy. Treatment is started with a tablet (0·5 gm.) of sulphamezathine or sulphadiazine or sulphatriad crushed into a powder in a teaspoonful of milk or water. This is followed by ½ tablet (0·25 gm.) every six hours day and night and continued for two days after clinical cure. Local treatment consists of three-hourly irrigations with normal saline. Usually this is only required for the first 24 hours. After each irrigation paroleine drops are instilled to prevent the eyelids sticking together. If the cornea becomes hazy, 1 per cent. atropine drops are instilled twice a day.

2. *Purulent conjunctivitis of adults*

This is usually caused by the gonococcus but more rarely by a variety of organisms. It is a serious disease with a serious prognosis, and in-patient hospital treatment is necessary. The same method of treatment should be adopted as for ophthalmia neonatorum except that full adult doses should be given if the sulphonamide method of treatment is employed. If one eye only is affected, the healthy eye should be protected by covering with a Buller's shield, which consists of a concave glass inserted into the middle of a square of waterproof material and fixed over the eye with adhesive tape.

Phlyctenular conjunctivitis and keratitis

Phlyctenular conjunctivitis is a local allergic response of systemic tuberculosis and the toxin producing it is probably the protein resulting from the destruction of actual tubercle bacilli. It is very common in tropical countries and attacks adults as well as children, causing scarring of the corneae and defective vision. A large proportion of cases have associated tuberculosis of the lung or of the cervical or abdominal glands. When the cornea is involved there is intense blepharospasm, lachrymation and excoriation of the skin around the eyelids. General treatment by fresh air and good food with sufficient protein and vitamin A is important. The tonsils are often enlarged and septic. Tonsillectomy should be done in these cases and often produces dramatic results. Systemic streptomycin therapy (0·5 gm. to 2 gm.) a day intramuscularly for one or two months is useful in severe forms of the disease and to prevent relapses.

Local treatment. Uncomplicated phlyctenular conjunctivitis requires only simple local treatment. If available, streptomycin 1 per cent. in solution twice a day, or dusting with streptomycin powder in an amount equal to the size of a pinhead once a day is efficacious. If streptomycin is not available, yellow oxide of mercury ointment 1 per cent. twice a day may be used. If acute blepharospasm is marked, the important point is to

get the pupil dilated with 1 per cent. atropine ointment. The eyes should be protected by dark glasses and should never be bandaged.

Phlyctenular disease has largely disappeared in England owing to the improvement in living conditions and in diet.

Trachoma

Trachoma is the greatest cause of defective vision and blindness in the world and is often associated with prolonged suffering. It is essentially a disease of children and as a rule is preceded by acute conjunctivitis. The virus of trachoma is carried from eye to eye by flies, contaminated fingers, towels, etc. Trachoma may be mild or severe, varying in different countries and races, and may progress for months or years. The treatment is confusing as opinions differ on the efficacy of the sulphonamides and the antibiotics against the virus. Some ophthalmologists are of opinion that these drugs have a specific action on the virus, while others consider that improvement results only from control of the accompanying secondary infection. The results obtained by the local applications of these drugs in some countries fall far short of the results which are claimed in others. The first essential in treatment is that children and others affected should be placed in as favourable sanitary and hygienic surroundings as possible. Before commencing local treatment exuberant follicles or papillae should be removed by some mechanical means, under 4 per cent. cocaine, by rubbing them gently with a mounted swab or by squeezing the tarsus between the blades of an expression forceps or by gentle curetting with the sharp spoon, but as more effective medical treatment of trachoma becomes available to ophthalmologists, mechanical adjuncts will become less and less necessary.

Local treatment should be directed towards promoting the disappearance of the follicles as quickly as possible without causing the formation of an excessive amount of scar tissue. In the present stage of our knowledge this is best accomplished by the local application of 1 per cent. aureomycin or terramycin [oxytetracycline] or chloramphenicol, if available, 3 times a day as drops or ointment for a period of 2 to 6 weeks.

As an alternative treatment the eyelids should be everted and the tarsal conjunctivae painted with 30 per cent. sodium sulphacetamide lotion daily for a month or so. Sodium sulphacetamide 6 per cent. in a base consisting of 60 per cent. petroleum jelly and 10 per cent. liquid paraffin should be used locally three or four times daily.

If the patient has a secondary infection of the conjunctiva, full doses of oral sulphonamides (sulphadiazine or sulphamezathine) for 3 or 4 days should be administered before expression of the follicles or local therapy is undertaken. As a routine treatment sulphonamide by mouth twice a day combined with local eye treatment with aureomycin or terramycin for 2–3 weeks produces good results. It is of interest to note that trachoma in leprosy patients under treatment with sulphones heals automatically in the course of time without any local eye treatment, but for the routine treatment of trachoma the sulphonamides are better than the sulphones. Painting of the conjunctiva, under 4 per cent. local cocaine anaesthesia, with slightly caustic solutions (1 per cent. silver nitrate or 1 per cent. copper sulphate) once or twice a week is in some cases permissible, but application of the copper sulphate stick is a barbarous method of treatment and should never be done. If the cornea becomes involved the pupil should be kept dilated with 1 per cent. atropine ointment applied once a day. In severe and neglected cases of trachoma which do not improve on local

medical treatment, dramatic results are obtained by the radical operation of tarsectomy in which most of the upper tarsus and its adherent diseased conjunctiva are excised. The seriousness of trachoma lies in the frequency with which the disease attacks the cornea, producing pannus, recurrent ulcers and gross scarring, with subsequent loss of vision.

Epidemic kerato-conjunctivitis

This disease is also called superficial punctate keratitis. In epidemic form it affects vast numbers of people in the tropics; the epidemics usually occur at the beginning of the rainy season and are more common in the coastal towns. Both eyes may be affected but usually the disease is confined to one eye. There is considerable discomfort, with hyperaemia of the bulbar conjunctiva, oedema of the lids and a watery discharge. The preauricular gland is invariably enlarged. Subsequently small raised discrete grey spots appear on the cornea and may or may not stain with fluorescein. The disease may cause difficulty in early diagnosis and should not be confused with catarrhal conjunctivitis. Warm saline lotion and 1 per cent. atropine drops (once a day for 3 days) will cure most cases by the 10th day. The new antibiotics have no significant effect on the course of the disease.

Corneal ulcer

In the tropics ulceration of the cornea with hypopyon is very common, owing to the rifeness of opportunities for infection and the want of care of eye injuries at an early stage. It is important to differentiate a corneal ulcer from non-ulcerative inflammatory reactions of the cornea such as in interstitial keratitis. Large erosions of the cornea produce no difficulty in diagnosis, but small breaches of the epithelial surface can be demonstrated by 1 per cent. fluorescein. This is best carried out by moistening the end of a glass rod with the fluorescein, applying the rod to the lower tarsal conjunctiva and then instilling a few drops of normal saline solution. If there is any breach in the corneal surface it will stain bright green. A swab from the conjunctiva should always be taken for bacteriological examination but every case should be treated at once on the assumption that it is caused by a penicillin-sensitive organism. The majority of the cases are due to staphylococci, streptococci and pneumococci, which are penicillin-sensitive organisms. If after 24 hours penicillin has not produced a distinct improvement, or the culture reveals a Gram-negative organism, the penicillin should be stopped and replaced by streptomycin. Infections of the cornea due to *Proteus* and *Ps. pyocyanea* respond well to streptomycin. The best results are obtained by subconjunctival injection of penicillin or streptomycin. The injection contains 1,000,000 units of crystalline penicillin G or 0·5 gm. streptomycin dissolved in 10 minims of sterile water and 3 minims of adrenaline (1 in 1,000). The injection should be given 5 mm. from the limbus after preliminary surface cocaine anaesthesia. Patients tolerate subconjunctival injections well and they can be repeated a second or third time at intervals of 24 hours if considered necessary. Most cases respond well to one injection, but treatment must be continued. The intra-ocular level of penicillin can be maintained by instilling high-potency penicillin ointment (100,000 units per gm.) at intervals of 2 hours for 2–3 days. Crystalline penicillin only should be used and the best base is 90 per cent. petroleum jelly and 10 per cent. liquid paraffin. In the case of streptomycin therapy the intra-ocular level can be obtained by instilling $\frac{1}{2}$–1 per cent. streptomycin drops or ointment at intervals of $\frac{1}{2}$–4 hours for 2–3 days. The prolonged use of streptomycin

tends to produce local irritation. All cases of corneal ulcer require to have 1 per cent. atropine drops or ointment instilled into the affected eye morning and evening. Hypopyon ulcer is often accompanied by chronic dacrocystitis and if there is regurgitation on pressure over the lachrymal sac, the sac should be excised without delay, otherwise the corneal ulcer will progress. In neglected or advanced cases of hypopyon ulcer there is frequently secondary glaucoma and the only hope of saving the eye is to relieve the tension by paracentesis or drainage of the anterior chamber. This is carried out by incision through the cornea close to the limbus in the lower temporal quadrant, or by incision through the base of the ulcer with a Graefe knife. The newer antibiotics, aureomycin, chloramphenicol and terramycin are all very insoluble substances and cannot be used for subconjunctival injections. They are best used as suspensions in ointment form for infections due to organisms insensitive to the sulphonamides and penicillin.

Vernal conjunctivitis or spring catarrh

This disease is uncommon in the British Isles but frequently occurs in the inhabitants of tropical countries. It usually attacks young people and is liable to be mistaken for trachoma. It has a tendency to show periods of exacerbation followed by remissions. The disease may attack the tarsal conjunctiva or the limbus or both. In typical cases the tarsal conjunctiva of the upper eyelid is replaced by a mass of hard, flattened, pale pink granulations which are absent from the lower fornix. When the bulbar conjunctiva is affected, the part invaded is the limbus and the new-formed tissue may implicate a large portion of the cornea but does not spread over the central part. The discharge is mucous and contains a large number of eosinophil leucocytes. Patients complain of great itchiness of the eyes and are seen to rub them constantly. In treatment the general health is important. Good food with sufficient protein and vitamin A are essential. If the tonsils and adenoids are enlarged, they should be removed. The cause of the disease is unknown, and local treatment is therefore symptomatic. Irritation in the eyes can be relieved by adrenaline drops and wearing tinted glasses. Cortisone drops or ointment, instilled 3 times a day, are useful in controlling the disease in the early stages and in relieving the symptoms of irritation.

Pinguecula and pterygium

In dry, hot, dusty climates these little growths are very commonly met with, but in Europe they are uncommon. A pinguecula appears as a small yellow growth on the inner side, but sometimes on both sides, of the bulbar conjunctiva. A pterygium appears as a triangular fold of altered conjunctival tissue with its apex on the cornea and its base towards one or other canthus. The natural tendency of the pterygium is to continue to grow and to invade the cornea over a wider and wider area until in time it advances over the clear cornea in the direction of the pupil and may pass right over the pupillary area. Pterygia are much commoner on the inner side of the cornea but may occur on the outer side as well. Both growths are due to inflammation and secondary degeneration. A pinguecula has no serious significance and the patient should be assured to this effect and advised to leave it alone. If, however, he wishes to be relieved of the disfigurement, excision may be performed, under local anaesthesia; it is a very simple operation. In the case of a pterygium, if the cause of chronic irritation is removed, it may cease to grow. If the growth is extending

over the cornea, no time must be wasted and the sooner it is dealt with surgically, the better. If there is any inflammation, it is wise to undertake a few days of preliminary treatment with some antiseptic drops before operation. For some early pterygia simple excision will suffice, care being taken to take the head of the growth off the cornea in order to remove it as completely as possible from this region. For larger growths a more extensive operation should be done. Probably the best operation is D'Ombrain's. Under local anaesthesia a horizontal incision is made with scissors in the bulbar conjunctiva above the upper border and below the lower border of the pterygium, from the limbus to the nasal side for 5 mm. The closed scissors are pushed downwards through the upper incision beneath the pterygium. The pterygium is now firmly held with a small dressing forceps and with a sharp Graefe knife the apex of the pterygium is shaved from the cornea, a thin layer of cornea being included in the shaving, so as to ensure complete removal of all the conjunctival tissue with its blood vessels. The apex of the pterygium is now free and is grasped at its tip by a fixation forceps and held up, vertical and taut, by an assistant. Then the whole subconjunctival portion of the pterygium, from the under-surface of the epithelial layer as far medially as the plica semilunaris, is dissected out. This comes away in one triangular piece and is a remarkably thick and extensive structure, underlying the whole extent of the pterygium. The free edge of the conjunctiva is now trimmed so as to excise a small piece of it and thus leave a bare strip of sclera 5 mm. in width. The conjunctiva rapidly grows over the scleral strip but not before the corneal surface is healed. Antiseptic drops and 1 per cent. atropine drops are instilled into the conjunctival sac and the eye is then bandaged.

SUMMARY OF RECENT ABSTRACTS *

VI. PLAGUE †

General

A very complete monograph on plague has been written by Pollitzer and published by WHO (p. 792); it is to be translated into French. The monograph was first published in separate parts in the *Bulletin of the World Health Organization*, and the parts have been reviewed separately (see pp. 56, 57, 175). It is a most authoritative work. Mention may be made of his classification of plague into 2 groups:—1. Bubonic (zootic) plague; 2. Primary pneumonic (demic) plague. All forms transmitted from animals to man are in the first group, and the form transmitted from man to man is the second.

A note on plague in the Belgian Congo, intended to be read in conjunction with a nosological map (to be published later) is contributed by Gillet (p. 579).

A description of 30 years' work at the Pasteur Institute in Madagascar is given by Robic (p. 1060).

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* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1954, v. 51. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on plague in this series see the July issues of the *Tropical Diseases Bulletin* each year since 1939.

Animal Reservoirs: Transmission

In the second report of the WHO Expert Committee on Plague (p. 373) the remark is made that in central Africa domestic rodents appear to be the main reservoir of plague. This opinion, however, may now need modification, for examination of rodents in part of Kenya, where an outbreak of plague occurred in man in 1952, showed that few domestic rats were implicated and that the infection existed in the field rodents. Heisch *et al.* (p. 264) conclude that the wild rodents were the primary reservoir, and that these animals, which are relatively resistant, are more important than the more susceptible domestic rodents in carrying infection over in inter-epizootic periods.

Davis (p. 377) has compiled a valuable survey of information on the importance of wild rodents in plague in Africa, for which he has analysed replies to a questionary sent out by WHO. It had been thought that only one true wild-rodent plague area was recognized, namely in southern Africa, but recent reports [for instance, Heisch *et al.*, above] have indicated a much wider distribution, and this may well constitute the real problem of African plague, as pointed out in comment by Megaw. Davis (p. 377) also reports a detailed study of plague among colonies of gerbils in an area of South Africa in which a series of outbreaks had occurred in 1924 and again in 1938–39. A systematic programme of estimation of the numbers of gerbils showed that the population fluctuated, with a general tendency to decrease. Natural transmission was found from *Tatera* to *Rattus* or to *Mastomys*, and almost certainly from *Rattus* to *Mastomys*. Living plague-infected fleas were found in burrows which had been deserted for 4 months, and it seems that fleas (especially *Xenopsylla philoxera*) may be more important than wild rodents in carrying over infection in inter-epidemic periods. Oliff (p. 174) has contributed a paper on the ecology of *Rattus natalensis* (often known as *Mastomys coucha*) which is closely associated with plague in South Africa.

Baltazard *et al.* (p. 174) write of the persisting foci of plague in species of *Meriones* in Kurdistan; there foci are circumscribed and persistent, but are not very dangerous to man. The rodents show considerable variation in susceptibility to the infection, but resistance on the whole is high, so that they maintain their numbers.

De La Barrera (p. 378) describes the wild rodents infected with plague in Argentina; they include 3 species of Caviidae and 10 of Cricetidae.

Ecke and Johnson (p. 171) report a study of plague in Colorado, where the disease was discovered in field rodents in 1941. They state that ranchers have been known to capture " prairie dogs " (which are rodents) suffering from plague and to introduce these sick animals into distant places where the animals are troublesome pests, the object being to keep the numbers down by introducing the disease. They give a list of mammals and their fleas concerned with plague in the area. In the same monograph Miles *et al.* (p. 171) discuss plague in Texas. The first record was in 1920 when human cases occurred; the infection appears to have been introduced by shipping. In the survey now reported *Pasteurella pestis* was found in pools of fleas and rodent tissues, especially *Neotoma micropus* and their fleas. No infection was found in domestic rats.

An epidemiological study of the epidemic of plague in Marseilles in 1720 has been made by Lavier (p. 374), who thinks that the evidence points to man-to-man transmission. It was introduced from a ship from the Levant. French authorities have also claimed that in Morocco plague may be transmitted from man to man through the human flea *Pulex irritans*, and Swellengrebel (p. 57) has investigated the ectoparasites of man there to

assess the possibility of this form of transmission. He concludes that infestation is so heavy that transmission through *P. irritans* is possible.

Aetiology

General

In broth, cultures of *P. pestis* show a lag phase which can be considerably reduced if a filtrate of a previous culture is added to the medium; it seems that the filtrate adds some nutritive factor produced by lysis of the *P. pestis* cells or by the fresh cells themselves (Girard and Gallut, p. 173).

Silverman *et al.* (p. 1060) describe a synthetic medium of 22 ingredients. A non-virulent strain grown in this gave a supernatant fluid which was protective for mice.

The metabolic reactions of *P. pestis* are being investigated by Santer and Ajl (p. 793), whose first paper is on terminal oxidations. Levine *et al.* (p. 793) show that the L-isomer of serine is oxidized by *P. pestis*.

Mice become more susceptible to injection of living or killed cultures of *P. pestis* after exposure to X-rays, and Silverman *et al.* (p. 690) consider this to be due to increased susceptibility to the endotoxin which results from the general stress of radiation injury.

Biochemical Studies

Information on the biochemical classification of *P. pestis* points to 2 well defined races:—one in which glycerol is fermented (found in central and north-west Asia), and one in which it is not. Pollitzer (p. 375) discusses the subject and notes that reports from many countries support this classification, but there are many from which no information is available. A systematic survey is needed.

Three varieties of *P. pestis* are recognized by Devignat, and two media for differentiation of these and *P. pseudotuberculosis* are described by Devignat and Boivin (p. 376). The strains have the following characters:—

	Glycerol fermenting	Nitrous acid producing
P. pestis orientalis ...	−	+
P. pestis antiqua ...	+	+
P. pestis mediaevalis ...	+	−

The first is a solid agar medium containing glycerol, rhamnose and potassium nitrate; the second is a semi-solid medium, containing urea and inulin, for stab cultures, which give a clear indication of the motility of *P. pseudotuberculosis*. Devignat (p. 1059) has elaborated these findings in another paper, in which he also discusses the response of *P. pestis* and *P. pseudotuberculosis* to bacteriophage.

Girard (p. 376) states that the differentiation of *P. pseudotuberculosis* from *P. pestis* is easy, depending on tests for motility, production of urease, fermentation of glycerol, and of rhamnose. Seal (p. 266) discusses the methods now used for the differentiation of *P. pestis* and *P. pseudotuberculosis*.

Virulence: Immunizing properties

Investigating the question of virulence in *P. pestis*, Burrows and Bacon (p. 793) show that when the classical non-virulent strain Tjiwidej was grown from a single cell and subjected to X-ray or ultraviolet radiation, only one virulent mutant occurred in 237 trials, and that the proportion of

virulent and non-virulent cells in the suspension used for testing was probably in the range 1 in 1,000 to 1 in 10,000. They (p. 794) observed that virulent strains injected into the peritoneal cavity of mice showed progressively increasing resistance to phagocytosis, whereas non-virulent strains did not, but that resistant organisms washed several times in phosphate buffer lost this resistance. There was evidence that injection of virulent organisms impaired the phagocytic efficiency of the leucocytes also.

Seal (p. 173) has studied the specific soluble protein fractions of *P. pestis*; he thinks that the protective power of the Haffkine vaccine lies in the protein fractions in the supernatant fluid of cultures, especially in the fraction precipitated by one-third saturation with sodium sulphate.

Seal (p. 265) has studied the growth, salt stability and biochemical reactions of virulent, avirulent protective, and avirulent non-protective strains of *P. pestis*; the non-protective strains differ from the others in various ways. The agglutination test can be facilitated by using live suspensions of young organisms and incubating at 37°C. overnight. The author recognizes a surface antigen which is protective to mice and corresponds to the fraction precipitated by one-third saturation with sodium sulphate, and a somatic antigen which is not protective. He describes a precipitin test which gives results consistent with those obtained with the agglutination test.

Although the virulence of *P. pestis* is correlated with the amount of envelope substance (Fraction I) produced (which protects against phagocytosis and probably blocks the action of antitoxin) and to a lesser degree with the amount of toxin produced, Englesberg *et al.* (p. 913) find that occasional avirulent strains produce as much envelope substance and toxin as virulent strains, and argue that some other factor must be involved, possibly catalase production. Fraction I is regarded as the factor chiefly concerned in immunization. Englesberg and Levy (p. 914) have cultivated a non-virulent strain in a medium selected by trial, and have obtained a vaccine with a very high content of Fraction I, which reaches maximum concentration on the 3rd day of cultivation. Fraction I is regarded as the gelatinous envelope or slime layer of the bacterial cell, and as quite distinct from the true capsule. An improved method of producing plague toxin by cultivation of *P. pestis* in a casein-hydrolysate-mineral-glucose medium is described by Englesberg and Levy (p. 1243). The toxin is in a comparatively high degree of purity.

From a study of various plague vaccines Meyer (p. 379) concludes that the crucial point in both primates and human volunteers is the amount of water-soluble envelope antigen (Fraction I) administered, whether as killed vaccine or avirulent live vaccine. Immunity resulting from vaccination in this way can be greatly increased by re-vaccination in 3–6 months and thereafter each year. There is no proof that live vaccines are better than Fraction I antigens, but strain EV 76 is an excellent agent when used in the living state, though it may give severe reactions.

Haemagglutination tests

Highly purified capsular ("envelope") protein of *P. pestis* does not sensitize normal sheep erythrocytes in such a way as to render them agglutinable by antiplague serum, but Landy and Trapani (p. 795) show that if the cells are first treated with a weak solution of tannic acid they become capable of adsorbing the protein and therefore become agglutinable.

This is the principle of the Boyden haemagglutination test for the detection

of plague antibodies, which has been used by Néel and Baltazard (p. 689) with sera from experimentally infected rabbits. The sheep red cells are first treated with tannic acid (1 in 15,000) to inhibit spontaneous haemolysis and agglutination, and the highly purified antigen (Fraction 1A) contains a minimum of polysaccharides. Néel *et al.* (p. 915) tested various reactions —bacterial agglutination, conglutination, etc.—for detection of plague antibodies in highly resistant rodents, and concluded that the Boyden protein haemagglutination test was the most sensitive. They did not do the complement-fixation test because it is known that the sera of certain wild rodents are anticomplementary and the sensitivity of the test is not greater than that of the agglutination test. Chen and Meyer (p. 914) show that if the sheep cells are not treated with tannic acid the only positive reactions in immunized animals are with the sera of rabbits immunized with the whole antigen of *P. pestis*; those immunized with Fraction IB gave negative results. They conclude from a large series of experiments that the protein haemagglutination test and the polysaccharide haemagglutination test are highly specific for the protein and polysaccharide fractions of *P. pestis* respectively. The former is valuable in diagnosis, being more sensitive than the complement-fixation and bacterial agglutination tests. The protein fraction inhibits phagocytosis and is a protective antigen; the polysaccharide fraction does not. The amount of protein in the envelope of the cell is regarded as being correlated with virulence, and an antigen from a virulent strain, or a concentrated Fraction I preparation, ought therefore to be more immunogenic than an antigen from a non-virulent strain.

Treatment

The WHO Expert Committee on Plague (p. 373) considers that for treatment streptomycin is to be preferred to the sulphonamides, but that the latter have considerable protective value when given to contacts, and are valuable in treatment if given early (see also Sokhey *et al.*, p. 379). A critical review of papers on the effective treatment of plague, with an account of work done on infected mice and monkeys with sulphonamides, streptomycin and the newer antibiotics, has been published by Meyer *et al.* (p. 580).

Girard (p. 58) strongly advocates the continued use of antiserum in addition to the new antibiotics, especially in the early stages when the toxic factor often predominates, and quotes experimental work on gamma globulin from hyperimmunized rabbits.

Control

A description of rodenticides of value in plague control has been compiled for WHO by Link and Mohr (p. 380). Warfarin ranks high for safety and effectiveness, but its true value must be determined by time and extensive field application.

Mercier and Razafindrakoto (p. 15) show that the residual insecticide programme in Madagascar has apparently extinguished plague in Tananarive (which had already been declining for many years). The proportion of *Xenopsylla cheopis* has fallen markedly. In parts of India the use of DDT has superseded fumigation with Cyanogas in plague control. Wagle and Seal (p. 380) prefer DDT to BHC because of its lasting effect. In Ecuador the use of DDT in rat burrows and in houses has been successful, but Sáenz Vera (p. 380) comments that there has been a progressive increase in resistance of fleas to DDT in certain areas. In an investigation of insecticides sprayed or dusted into burrows of ground squirrels, Ryckman

et al. (p. 175) found that aldrin, dieldrin and heptachlor were much more effective than DDT in reducing the numbers of fleas. *Charles Wilcocks*

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

D'Alessandro, G., Cefalù, M., Cracolici, M., de Grazia, G., Grassi, G. & Mariani, M. Indagini su malaria e anofelismo in Sicilia nell'anno 1953. [**Investigations into Malaria and Anophelism in Sicily during 1953**] *Ann. d. San. Pubblica.* Rome. 1954, Nov.–Dec., v. 15, No. 6, 1147–67, 2 graphs & 3 figs. on folding pl. [18 refs.] English summary.

From April to June 1953 the Hygiene Institute of the University of Palermo, in collaboration with the Provincial Health Office, carried out an enquiry into the prevalence of malaria and anophelism in an extensive area of the Province of Palermo which in the past suffered much from malaria. Subsequently the enquiry was extended to the whole of Sicily with the active support of the Chief Commissariat of Hygiene and Public Health. The present interim report refers to the results obtained in 1953: the work continued after the close of that year.

Blood examinations were carried out in 10 localities of the Province of Palermo, with a combined population of 111,652, which in previous years had been treated with residual DDT. Only 6 cases of malaria had been reported from these localities in 1952: in 1946 the total number of cases reported was 10,866. The blood of 6,249 persons was examined; of these 2,085 gave a history of malaria in the recent past; 7 were found harbouring *P. vivax*. No malaria infection was found in any of the 4,164 who had no history of malaria in the recent past.

During 1953 in the Provinces of Agrigento, Enna and Palermo a total of 13 cases of malaria was recorded, of which one was *P. malariae*, the remainder *P. vivax* infections. Only four of the *P. vivax* infections appeared to be primary, contracted in July or August. The remainder, observed in May or June, appeared to be relapses of infections acquired during the previous year. It would seem that malaria in Sicily has been reduced to insignificant proportions.

A check was made of the adequacy of DDT treatment carried out in the 9 Provinces of the Island. The method used was that of Alessandrini [see this *Bulletin*, 1950, v. 47, 1233]. The results showed that spraying was being carried out efficiently.

An examination was made of 14,043 anopheline larvae from 450 breeding places scattered through the Island. There were 7,512 *A. m. labranchiae*, 5,522 *A. claviger* and 1,009 *A. superpictus*. A map shows that breeding places of *A. labranchiae* are scattered throughout Sicily: in a few areas near the Tyrrhenian litoral the breeding of *A. claviger* predominates: breeding places of *A. superpictus* are widespread but much fewer. Thus the breeding places of anophelines are much as they were in former years but are much less prolific. *A. labranchiae* has acquired an extra-domiciliary form of life: its eradication would necessitate antilarval measures which

would be difficult and prohibitively costly. Moreover, eradication is not essential for the control of malaria as long as the DDT spraying programme is continued. No evidence could be found that the local anophelines had acquired any DDT resistance.

Observations were being continued and attention was to be paid to the effects of DDT spraying on the prevalence of insects, other than mosquitoes, of importance to public health. *Norman White*

Archibald, H. M. & Bruce-Chwatt, L. J. **Sickling and Malaria.** [Correspondence.] *Brit. Med. J.* 1955, Apr. 16, 970.

In a study of the possible relationship between sickling and malaria [see this *Bulletin*, 1955, v. 52, 195 for recent references], the authors recorded some malariometrical indices in African children.

They found in two recent surveys in Southern and Northern Nigeria that 107 of 529 children (20·2 per cent.) showed the sickle-cell trait. They compare, in two tables, the crude parasite rate and the positive parasite density index in sicklers and non-sicklers, dividing the children into 3 age-groups, namely 5–7 years, 8–10 and 11–15.

The total findings were as follows:

	No.	*Crude Parasite Rate*	*Positive Parasite Density Index*
Sicklers	93	61·2	2·32
Non-sicklers ...	436	55·3	2·20

These figures do not indicate any constant relationship between the two malariometric indices and the presence of the sickling trait, and this is particularly clear in the case of the positive parasite density. The tables show that in the 5–7 year group the figures of this index were 2·89 in non-sicklers and 2·61 in sicklers, corresponding to a difference of geometric means of about 470 and 380 parasites per cmm. This difference is too small to warrant the authors concluding that the malaria in these Nigerian children differed in severity in sicklers and non-sicklers. The study is being continued on a large scale. [It is not clear why the number of sicklers is shown in the tables as 93 instead of 107, as in the text.]

H. J. O'D. Burke-Gaffney

Satya Prakash. **A Note on the Malaria Problem in Bhuj, Kutch State.** *Indian J. Malariology.* 1954, Sept., v. 8, No. 3, 215–18.

Kutch is a seaboard state of growing importance in which malaria is persistently epidemic and has been previously surveyed [this *Bulletin*, 1939, v. 36, 9]. Figures are now brought up to date and show a high but very irregular incidence varying from 4,924 to 12,520 in a town of 30,000 population. In some years no seasonal peak is visible but in unhealthy years there are two peaks, a major one in the autumn and a minor and less regular one in the late spring. The causation of the latter is not understood [spring relapses do not seem to have been considered]. *Plasmodium falciparum* is the predominant parasite; spleen rates in the main town of Bhuj have increased; the parasite rate in this town is very variable, and the general picture is of highly unstable malaria for which a programme of control is being considered. *G. Macdonald*

Black, R. H. **Enlargement of the Liver due to Malaria in Natives of the South-West Pacific Area.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, May, v. 48, No. 3, 226–33, 2 graphs.

The author describes a common liver enlargement, increasing with advancing age, in the people of the non-malarious Bellona Island of the Solomons group and analogous to that previously described in a northern part of Western Australia [this *Bulletin*, 1950, v. 47, 1217]. No acknowledged common infective cause is present in either of these areas and a nutritional origin has previously been suggested. By examination of 4,047 subjects in Bellona and in malarious islands of the Solomons, Trobriand and New Hebrides groups the author demonstrates an additional form of liver enlargement, the incidence of which is so closely related to that of malaria that a causal relationship can be justifiably assumed. The rates increase from the 0–10 to the 11–20 age-group and thereafter decrease, but most notably in the hyperendemic areas in conformity with expectations from the development of immunity. Figures are also given for the degree of liver enlargement showing parallel happenings (the method of calculation might, however, be expected to produce this result).

Other known causes including prevalent malignant malnutrition can be reasonably excluded. [The case for common liver enlargement parallel to the spleen enlargement in endemic malarious areas, which has been authoritatively doubted, is here well supported.] *G. Macdonald*

Black, R. H. **Comparison of the Liver and Spleen Sizes in a Community in Netherlands New Guinea suffering from Malaria of a High Degree of Endemicity.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1955, Jan., v. 49, No. 1, 62–3.

In a previous paper [see above] the author correlated the frequency of spleen and liver enlargement in malarious communities in Polynesia. The evidence is here elaborated with reference to a single community in a very highly malarious part of Netherlands New Guinea. Demonstrable hepatic enlargement has a similar age distribution to splenic enlargement and analysis shows a high correlation between the degrees of the two enlargements in individuals. [The evidence here presented is insufficient to establish a single causation of the two conditions, but can reinforce other evidence.] *G. Macdonald*

Ch'en, Cheng-teh, Wu, Yao-tsing & Hsieh, Hsien-chen. **Differences in Detectability of Minor Splenomegaly through Variation in the Recumbent Position of the Patient.** *J. Formosan Med. Ass.* 1954, Sept., v. 53, No. 9, 561–7, 2 figs.

It is common knowledge that to detect by palpation minor degrees of enlargement of the spleen it may be necessary to examine the patient lying on his right side having his knees flexed and his left upper limb extended. The authors term this the "second recumbent position" to distinguish it from the "first recumbent position" in which the patient lies on his back. Using both positions in a malarial survey in Taiwan, which recorded splenic enlargement and parasite incidence, they found that among 3,546 schoolchildren, in 624 the spleen was only palpable in the second recumbent position compared with 386 in the first recumbent position. By including the former sub-group in the Size 1 of Hackett's classification [this

Bulletin, 1944, v. 41, 998], a greatly enhanced number was recorded. The authors point out that as the parasite rate in the sub-groups was almost identical (1·27 per cent. and 1·28 per cent., respectively) and significantly greater than the rate (0·50 per cent.) among the 1,980 in whom the spleen was not palpable in either position, the inclusion of the cases from the second recumbent position gives a truer reflection of the incidence of malaria. The low parasite rates were attributable to recent anti-vector control measures preventing reinfection. *Frederick J. Wright*

Horsfall, W. R., Mosquitoes. **Their Bionomics and Relation to Disease.**

This book was reviewed on p. 497.

Swellengrebel, N. H. **On *Anopheles plumbeus*.** *Riv. di Parassit.* Rome. 1954, Oct., v. 15, No. 4, 667–9.

Professor Swellengrebel points out that malaria is essentially a rural disease, so far as breeding places of *Anopheles* are concerned, and that the outskirts of a city protect invasion of its centre, unless the city is very small or the breeding of *Anopheles* outside it is prolific. These conditions should not be classified as urban malaria, nor should those of a garden city or those in which artificial breeding places are created by abnormal conditions, such as bombing (as occurred in Middelburg, island of Walcheren, in 1942).

The term urban malaria is appropriate when transmission is effected by anophelines adapted to breeding places peculiar to the city, as, for example, the breeding of *A. claviger* in cisterns in Jerusalem or *A. stephensi* in iron tanks and deep wells in Bombay. The author does not therefore regard as truly urban the indigenous malaria reported in London by Crockett and Simpson [this *Bulletin*, 1954, v. 51, 132], as it was believed to be transmitted by *A. plumbeus*, which, as Shute pointed out [*ibid.*, 759], is common in parks and other places in towns where waterholding cavities occur in trees.

The picture is different in Amsterdam and the author recalls the presence of a breeding place some years ago in a concrete trough in the basement of the Institute of Tropical Hygiene, so situated that rainwater seeped in and dead leaves were swept in by the wind. Larvae of *A. plumbeus*, but of no other species, were present for several weeks.

Malaria occurs periodically in the city of Amsterdam, especially where the city expands into a rural background: here there are prolific breeding places of short-winged *A. maculipennis* types, but none of the animal habitations characteristic of a true rural area. Every year there are some cases of malaria in those living in the old town, which is separated from the rural areas by new housing estates. Since 1922 there have been 12,037 proved cases of malaria and 647 (about 1 in 18) occurred within the old town, although the population is only about 1/6th of that of the whole city. Probably most of these persons were infected elsewhere, but there is no doubt that some of the cases were indigenous.

There are few parks in the old town, but there are trees in small private gardens, so that the breeding of *A. plumbeus* in its natural habitat may occur: but the type of artificial breeding place described above is much more likely to occur in an old and densely built town.

Professor Swellengrebel concludes: "The case against *A. plumbeus* as a transmitting agent of malaria is not proven. If it ever should be, its

rôle as an urban vector may turn out to be bound up with certain deviations from the ordinary pattern of larval behaviour, as is the case in *A. claviger* in areas where it is acting as an urban vector."

H. J. O'D. Burke-Gaffney

Guelmino, D., Kostić, D. & Jevtić, M. **A Contribution to the Study of *Anopheles* in Serbia.** *Bull. Acad. Serbe des Sci.* Belgrade. 1954, v. 11 (n.s.), Classe Sci. Méd., No. 2, 37–8.

There are 5 species of *Anopheles* represented in Serbia, namely the *maculipennis* group, *A. claviger*, *A. superpictus*, *A. nigripes* [*plumbeus*] and *A. hyrcanus*.

Of the *maculipennis* group *A. m. messeae* and *A. m. atroparvus* are restricted to a narrow belt of flats along the northern rivers—the Sava and the Danube—where they breed in permanent marshes, but *A. m. atroparvus* also breeds in open drainage canals in the Godomin fields near the town of Smederevo. While *A. m. atroparvus* usually amounts to only 2 to 7 per cent. of the *maculipennis* group in northern Serbia, in the area mentioned it reaches 70 per cent. In the marshy northern areas generally, the distribution within the group is stated to be about 70 per cent. *messeae*, 26 per cent. *typicus* and 4 per cent. *atroparvus*.

A. m. typicus is however also seen over the whole of central and southern Serbia and it breeds in both flats and uplands, even as high as 1,000 metres.

Some relative figures of distribution in selected areas are given.

A. claviger is widespread, but lives mainly away from human dwellings. *A. superpictus* is present only in small numbers, and is of secondary importance as a vector of malaria. *A. nigripes* [*plumbeus*] has been found in many areas throughout Serbia, but *A. hyrcanus* was found only in one locality in the north-west.

H. J. O'D. Burke-Gaffney

Smith, A. **The Distribution and Host Choice of Resting *A. gambiae* Giles and *A. funestus* Giles in Cone Huts on Ukara Island, Tanganyika.** *East African Med. J.* 1955, Jan., v. 32, No. 1, 7–13.

The cone huts on Ukara Island, Tanganyika, are thatched from top to bottom and are occupied by people and animals, a partition separating them. The door leads into the animal section which is usually more thinly thatched or sometimes without thatching. The occupants averaged 3·3 people, 2·8 cattle and 1·6 goats per hut, in 40 huts examined.

The resting patterns of *Anopheles gambiae* and *A. funestus* in these huts during the rainy season, March to May, were compared with those during the dry season, June to October.

A series of collections made throughout both seasons showed that female mosquitoes rest in all parts of the huts but mostly below 7 ft. from floor level and on the side occupied by the people. A bigger proportion of *A. funestus* than of *A. gambiae* rest in man's section. A comparison of seasonal figures indicates that in July there is some dispersion towards the tops of the huts and towards man's section. Both species feed almost entirely on ox and man but the proportion of *A. gambiae* feeding on ox is greater in July than in April.

The change in resting position may be related to weather changes in Ukara between April and July. A strong east wind blows from May to September and the mosquitoes seek the more sheltered hut tops and man's section. No satisfactory explanation is known to account for the increased diversion of *A. gambiae* from man to ox in July.

H. S. Leeson

Myatt, A. V., Coatney, G. R., Hernandez, T. & Guinn, Elizabeth. **Effect of Blood Group on the Prepatent Period of Inoculated *vivax* Malaria.** *Amer. J. Trop. Med. & Hyg.* 1954, Nov., v. 3, No. 6, 981–4. [22 refs.]

Fifty-four volunteers were inoculated intravenously with blood containing approximately a million *Plasmodium vivax* (Chesson strain), and the length of the prepatent period (the first appearance of parasites in a thick film) was studied in relation to the blood groups of donors and recipients. The prepatent period was 3·4 to 3·8 days when blood of compatible groups was used, and about the same period for all the other combinations (*e.g.*, A and AB, O and B), except when O recipients received A blood; in this case the mean prepatent period was prolonged to 11·3 days. Thus incompatibility of blood groups may be an important factor in assessing the results of chemotherapeutic tests. *P. C. C. Garnham*

Wilson, T. & Edeson, J. F. B. **Studies on the Chemotherapy of Malaria. III. The Treatment of Acute Malaria with Chloroquine.** *Med. J. Malaya.* 1954, Dec., v. 9, No. 2, 115–31, 4 figs. [20 refs.]

The trials reported in this paper were carried out in hospitals at Tampin and Kuala Lumpar, Malaya, between May 1948 and September 1954. The subjects treated were local Asians, presumably to be regarded as semi-immune to malarial infection. The products tested were SN-7618 (Parke, Davis & Co.), Resochin (Bayer) and Nivaquine (May & Baker). The first two of these are chloroquine diphosphate, the third chloroquine monosulphate. No differences in therapeutic effect between the three products were noted. "Failure" was defined as the continued presence of asexual parasites on the 7th day after treatment had begun.

The authors treated 351 patients suffering from acute *P. falciparum* malaria with a single dose of 0·15 to 0·9 of chloroquine base. There were 4 failures in this group, all in patients who had received 0·25 gm. or less of base; the failures were attributed to insufficient dosage. Full-course treatments, totalling 0·75 to 2·5 gm. of base, were given to 169 patients with acute *P. falciparum* malaria.

Single-dose treatment, as above, was given to 77 patients with acute *P. vivax* malaria, and 27 received full-course treatments totalling 0·75 to 1·8 gm. of base. There were no failures.

Four patients with acute *P. malariae* infections received the single-dose treatment. One of these had a recurrence within 2 weeks.

Thirty-eight patients (36 *P. falciparum*, 2 *P. vivax*) received intramuscular injections of chloroquine; no toxic reactions were noted. One patient was given the drug intravenously, and this gave rise to a rapid fall in blood pressure and disturbances of vision. There were 7 deaths among 564 patients with *P. falciparum* malaria, 5 of these occurring within 24 hours after admission to hospital.

The authors conclude that chloroquine in any form is highly effective for the treatment of acute malaria in Malaya. It proved more reliable than mepacrine as a single-dose treatment, and in general it had a more rapid effect on fever and symptoms. There were no indications of toxicity at the dosage used, nor of any tendency to provoke resistance. It is considered that on these grounds chloroquine has a strong claim to be regarded as the drug of choice for the treatment of acute malaria and for malaria suppression. A single dose of 0·6 gm. should be adequate for perhaps two-thirds of all Asian patients in Malaya seeking treatment for acute malaria; most of the rest will be effectively treated with an oral dose of 1·5 gm. in

3 days (0·6 gm. × 2, 0·3 gm. × 1); a combination of parenteral and oral chloroquine is the authors' treatment of choice in heavy *P. falciparum* infections with complications. *G. Covell*

Beutler, E., Dern, R. J., Flanagan, C. L. & Alving, A. S. **The Hemolytic Effect of Primaquine. VII. Biochemical Studies of Drug-Sensitive Erythrocytes.** *J. Lab. & Clin. Med.* 1955, Feb., v. 45, No. 2, 286–95, 1 fig. [38 refs.]

The red cells of some persons are sensitive to haemolysis by chemical agents including the 8-aminoquinoline primaquine. Various investigations [this *Bulletin*, 1954, v. 51, 676; 1955, v. 52, 8, 334, 509, 510] have been made previously to discover the defect responsible for the unusual behaviour in which the formation of Heinz bodies may be characteristic and which has been regarded as the first stage in the haemolytic process observable *in vitro*. It was thought that the sensitive type of cell might lack some of the enzymes or co-enzymes which are common to all red cells and are more abundant in young forms. Glycolytic, catalase, carbonic anhydrase and cholinesterase activity was therefore measured in sensitive and non-sensitive cells to see if any differences existed, and the effect of inhibition of these enzymes on Heinz body formation noted. Reasons are given for the selection of these particular enzymes, and the methods employed to study them are described. The selection of patients, methods of evaluating Heinz body formation and other techniques used in the present investigation have been described in earlier studies [Beutler *et al.*, *ibid.*, 1955, v. 52, 510].

It was found that none of the enzymes examined appeared to be associated with sensitivity of red cells to haemolysis. It has also been considered possible by the authors that glutathione, which plays many important rôles in biological systems, could protect red cells against Heinz body formation by its properties as a reducing substance. They found that in primaquine-sensitive red cells the glutathione content was about 60 per cent. of that present in non-sensitive types and the action of sulphydryl inhibitors caused non-sensitive cells to become sensitive and as susceptible to Heinz body formation *in vitro*. Whether this deficiency of sulphydryl groups in the sensitive cells is directly related to primaquine sensitivity or is a secondary effect is not quite clear, nor is the means by which sulphydryl groups may protect red cells against haemolysis. A glutathione-containing enzyme rather than the substance itself may have been the factor involved. *J. D. Fulton*

Rafi, S. M. **Evaluation of 2nd Year of Extensive Spraying Operations in the Punjab during 1953.** *Pakistan J. of Health.* 1954, July, v. 4, No. 2, 66–74, 8 graphs & 1 map.

Previous control work in the Punjab [this *Bulletin*, 1953, v. 50, 1012; 1954, v. 51, 768] was extended in 1953 to cover 2·6 million people in the areas most threatened by epidemics. Houses and cattle sheds in the villages newly taken into the scheme received one application of about 2 gm. DDT per sq. metre before the start of the malaria season, and those previously included received one application of about 1·0 gm. per sq. metre in the early part of the season. The lower dose was given to avoid reducing resistance of the population (by further reducing spleen rates) and because

only a short period of efficacy was necessary [the two reasons appear mutually contradictory]. Results are presented in the form previously used and show that the peak of the autumn rise of malaria was reduced. It was not, however, entirely eliminated and appears to have been slightly higher than in the last two years. The highest infant parasite rate recorded in sprayed areas was 3·3 per cent., which is to be compared with 37·3 per cent. in neighbouring unsprayed areas. *G. Macdonald*

McArthur, J. **The Control of Malaria in Borneo. (An Account of the Tambunan Experiment.)** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, May, v. 48, No. 3, 234–41, 1 fig.

The Tambunan experiment set out to test the feasibility of control of malaria transmitted by *Anopheles leucosphyrus balabacensis* by simple clearance of shading vegetation over its known breeding places without the practice of other measures. The area tested covered 10 sq. miles in a highly malarious valley where the spleen rate had consistently been between 80 and 100 per cent. at examinations between 1936 and 1949. Following the clearance, which occupied 50 men for 3 months, the spleen rate in children dropped to 56, 53 and 45 per cent. in the next 3 years. It is recorded that the spleen rate in a comparison area, previously consistently 100 per cent., dropped to 75 per cent. owing to the unauthorized initiation of control by prophylactic drugs and mosquito destruction by a village headman. [The numbers of examinations made do not justify the weight of conclusion: the spleen rates in children in the comparison area are based on examinations of 7 and 8 children; that in the test area, based on examination of 78 children in 1952, is more useful but still inadequate.]
G. Macdonald

McGhee, R. B. **The Infection of Duck and Goose Erythrocytes by the Mammalian Malaria Parasite,** *Plasmodium berghei*. *J. Protozoology*. Utica. 1954, Aug., v. 1, No. 3, 145–8, 1 fig. [21 refs.]

Having previously demonstrated the ability of the avian parasite, *Plasmodium lophurae*, to invade mammalian erythrocytes [this *Bulletin*, 1950, v. 47, 1184; 1953, v. 50, 681] the author turned to the question of the susceptibility of avian red cells to infection by a mammalian malaria parasite. In the experiments described in the present paper the embryos of chicks, ducks and geese were inoculated intravenously with *P. berghei*, and stained blood films from them were examined daily for the results. The mammalian parasite failed to invade the chick erythrocytes, but those of ducks and geese were infected, though parasitaemia was very low, *viz.*, 33 and 17 per 10,000 erythrocytes in the respective recipients, in neither of which did the infection persist beyond 3–4 days. In the avian cells the appearance and development of *P. berghei* were unusual, as shown in the accompanying figures, and gametocytes were absent.

From these and previous experiments the author concludes that the host-specificity of malaria parasites is less rigid than is usually assumed and that duck erythrocytes are particularly susceptible to infection by a variety of species, the following of which have been successfully adapted to them: *P. lophurae*, *P. cathemerium*, *P. elongatum*, *P. relictum*, *P. gallinaceum*, *P. circumflexum*, *P. nucleophilum*, and now *P. berghei*.
C. A. Hoare

Highman, B., Greenberg, J. & Coatney, G. R. **Pathological Changes produced by *Plasmodium berghei* in Resistant and Non-Resistant Strains of Mice.** *Riv. di Parassit.* Rome. 1954, Oct., v. 15, No. 4, 449–59, 5 figs. [13 refs.]

The Kasapa strain of *Plasmodium berghei* was inoculated intravenously into two strains of white mice—Swiss and the LAF hybrid (2 months old). Sections and smears of organs and blood were prepared from 85 mice in different stages of the infection and were compared with uninfected controls. The Swiss strain was more susceptible to the parasite than the hybrid; in the former, parasitaemia amounted to 84 per cent. of the erythrocytes and death occurred in 8 days; in the latter, parasitaemia affected 60 per cent. of the erythrocytes and the mice sometimes lived for as long as 26 days. Non-pigmented parasites were found in the blood, and also in tissue smears in large mononuclear, Kupffer, and reticulo-endothelial cells. Their presence in such cells was confirmed in sections, where they were detected also in endothelial cells of brain capillaries and in alveolar septal cells. These exo-erythrocytic parasites as a rule stained poorly and were apparently undergoing phagocytosis, but some were well preserved and might have been developing in the tissue cells. The histopathology comprised fatty changes in the liver, kidney, heart and adrenals, with deposits of malaria pigment (first yellowish and finally black). Focal accumulations of large pale mononuclear and lymphoid cells occurred in the liver and heart, eventually leading to local necrosis. In one Swiss mouse haemorrhages in the cerebellum were found on the eighth day, and in another small abscesses were found on the 20th day in the cerebrum. The lesions occurred earlier in the Swiss strain, and were attributed to the severe toxaemia due to rapid haemolysis. The lesions were less marked in the hybrids and developed later; they were thought to be due to " hypoxia " as a result of anaemia.

P. C. C. Garnham

See also p. 642, Colas-Belcour & Vervent, Sur des infections mixtes de la souris à spirochètes récurrents et *Plasmodium berghei*. [**Mixed Infections in Mice of the Spirochaetes of Relapsing Fever and *Plasmodium berghei***]

Weathersby, A. B. **The Ectopic Development of Malarial Oocysts.** *Exper. Parasit.* New York. 1954, Nov., v. 3, No. 6, 538–43, 1 text fig. & 8 figs. on pl.

This paper presents further observations on the ectopic development of oöcysts of *Plasmodium gallinaceum* in *Aëdes aegypti* [see this *Bulletin*, 1953, v. 50, 605]. Serial sections were prepared of mosquitoes which had received infected blood by injection into their haemocoelomic cavity, and had been kept for 7 or 8 days at a temperature of 80°F. The number of mosquitoes originally injected was 182. Batches were dissected 12 days later; one batch was discarded owing to the lightness of the infection, a second lot showed sporozoites in 7 out of 17, and 51·5 per cent. of the remaining mosquitoes in this lot had ectopic oöcysts; in the third lot 6 out of 19 had ectopic oöcysts. The oöcysts were found in most tissues of the head (including palps), thorax and abdomen; more than half were in the thorax, usually attached to the fat body, but sometimes in muscle, on nerve ganglions and brain, on salivary glands, on ventral diverticulum and foregut, and on malpighian tubules; some were free in the haemocoele, but none was found

attached to the stomach. The oöcysts were of normal size and structure and no cellular reaction was present in their vicinity. *P. C. C. Garnham*

Jaswant Singh, Nair, C. P., David, A. & Krishnan, K. S. **Natural Immunity of Domestic Pigeons (*Columba livia* Gmelin) to Experimental Infections with *P. gallinaceum*.** *Indian J. Malariology.* 1954, June, v. 8, No. 2, 117–26.

This paper describes a thorough attempt to infect Indian domestic pigeons with *Plasmodium gallinaceum*. The birds were inoculated intravenously with either sporozoites or trophozoites of the parasite, and were kept for periods up to 2 months, the blood being examined on alternate days. Thirteen pigeons (including one 3 weeks old) received trophozoites, and 6 sporozoites: no infection could be detected either in the blood or in the organs. Two pigeons were inoculated with trophozoites and 15 days later their blood was subinoculated into chicks and this was repeated 3 times: no infections resulted. Another 4 pigeons were similarly inoculated, and after 15 days they were killed and emulsions of the organs inoculated into chicks, again with no result. A further 6 received sporozoites, and the organs were emulsified between 2 and 10 days later, but proved non-infective on subinoculation into chicks. Finally, blood of pigeons was taken in periods of a few minutes after inoculation with (a) infected blood and (b) sporozoites. Subinoculated chicks then developed an infection if the blood was taken not later than 1·5 minutes with the former and not later than 1 to 4 minutes with the latter. This solid natural immunity of pigeons to *P. gallinaceum* was unaffected by administration of 5cc. of fowl blood a day before inoculation, while up to 15cc. of pigeon blood were completely without effect on chicks inoculated at about the same time with the parasite.

[See also Huff, this *Bulletin*, 1951, v. 48, 525; David and Krishnan, *ibid.*, 1954, v. 51, 541.] *P. C. C. Garnham*

Okpala, I. & Manwell, R. D. **Chemotherapy of Avian Malarias: III. Trial of certain Standard Antimalarials on *Plasmodium hexamerium* and *P. elongatum* Malaria in Ducks.** *J. Parasitology.* 1955, Feb., v. 41, No. 1, 65–70, 1 fig.

The strain of *P. hexamerium* and the techniques needed for studying the effect of established antimalarial drugs on infections with this parasite were similar to those previously described [this *Bulletin*, 1953, v. 50, 604; 1954, v. 51, 1146]. The strain of *P. elongatum* was one freshly isolated from a song sparrow and gave rise to severe infections in ducks. The criterion of cure was disappearance of parasites from the peripheral blood and non-appearance on splenectomy of the host. When the suppressive power of drugs was being considered counts were made of sexual and asexual forms of the parasite. Infection was produced by intravenous inoculation of infected blood into the jugular vein. In all, 216 ducks were used in series of 36 and treatment was started within 1 or 7 days in different groups. Because of the poor response of *P. hexamerium* in the past to standard antimalarials it seemed possible that exo-erythrocytic stages were involved, but a search for them proved fruitless.

The authors have wisely asked themselves whether anything may be gained from testing established antimalarials against avian infections and answer the question in the affirmative, believing that the mechanisms

involved in the mode of action of drug may be uncovered. Their results to date have shown that different species of malaria parasites react very differently to drugs and that *P. hexamerium* is relatively resistant to most, except atebrin (quinacrine, mepacrine). It appears from results obtained that *P. elongatum* also offers considerable resistance to the drugs used although differences in the nature of these two infections exist. In *P. hexamerium* infections quinacrine and pentaquine were most effective in producing cure and camoquin [amodiaquine], chloroquine with primaquine, and chloroquine with quinine were active in that order. A percentage of ducks infected with *P. elongatum* could be cured with camoquin, chloroquine or primaquine in that order of activity but clearance of the blood was slow. *J. D. Fulton*

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal;* American—*Chagas's disease and other trypanosome infections. In each form the following order is followed*:—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

Mornet, P. Les trypanosomes pathogènes de l'A.O.F. Considérations sur leur répartition, leur fréquence, le taux d'infestation des animaux domestiques. [**The Distribution, Frequency and Degree of Infection in Domestic Animals of Pathogenic Trypanosomes in French West Africa**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 5, 709–20, 5 coloured folding maps. [24 refs.]

The incidence and distribution of the trypanosomes of domestic animals in French West Africa, based on recent investigations, are recorded in this paper. The number of animals studied is not reported but the incidence of infection with different species is given as follows: *Trypanosoma vivax* 48 per cent.; *T. congolense* 34 per cent.; *T. brucei* 14 per cent.; *T. evansi* 3 per cent.; mixed infections 1 per cent. The numbers examined for *T. simiae* and *T. theileri* were too small to yield significant figures. The reported incidences can only be regarded as approximate because the surveys were not made systematically. The prevalence of the various species is similar to that throughout most of Africa south of the Sahara. *T. vivax* was most widely distributed and was the commonest species in susceptible hosts, but in the south, particularly in Guinea, it was replaced by *T. congolense*. *T. evansi* was limited to the areas north of the tsetse belt in which dromedaries were present, *viz.*, Mauritania, Niger and Sudan.

The geographical distribution of each species, excluding *T. theileri*, is shown on a separate map. *T. vivax* was found 150 kilometres north of the northern limit of *Glossina* (14°N.) and it probably occurs up to 18°N., where cattle raising ceases, as a result of mechanical transmission from migrating beasts infected by tsetse further south. *T. congolense* is, in general, confined to the tsetse-infested area, but in two places it is found beyond the northern limit, in one of these by as much as 150 kilometres. Possible explanations of this are mechanical transmission, the existence of undetected *Glossina*, and the discovery of trypanosomes in migrating cattle which have been infected in the tsetse belt. In one of these areas the

presence of *T. brucei* and *T. simiae* suggests transmission by *Glossina*, but in the other mechanical transmission is suspected. The distribution of trypanosomes of the pig could not be mapped accurately owing to paucity of data, but on the map two northern limits of infection are shown, one based on actual findings, and the other representing the probable limit based on the distribution of *T. brucei*. The author was unable to determine whether more than one species of pig trypanosome was present, and he points out that the existence of *T. simiae* itself in French West Africa is disputed by some.

The article concludes with a discussion and summary of the literature concerning mechanical transmission of the species encountered in this area.

T. H. Davey

Trincão, C., Franco, A., Nogueira, A., Pinto, A. R. & Mühlpfordt, H. **First Report on the Treatment of Sleeping Sickness with Puromycin.** *Amer. J. Trop. Med. & Hyg.* 1955, Jan., v. 4, No. 1, 13–17.

Antibiotics have not hitherto proved of value in the treatment of trypanosomiasis. A new antibiotic—Puromycin—prepared from *Streptomyces albo-niger* has been shown to cure *Trypanosoma equiperdum* infections in mice when given orally or parenterally; in the untreated mice death occurred in 3 to 5 days, but over 50 per cent. of the treated survived at least 30 days. [See Porter *et al.*, *Antibiotics & Chemotherapy*, 1952, v. 2, 409; also this *Bulletin*, 1953, v. 50, 690; 1955, v. 52, 518.] The present authors have studied the effect of Puromycin on *T. cruzi* both *in vitro* and *in vivo*; in the former it was found to be trypanocidal to titres greater than 1 in 40,000. *In vivo* the results were erratic and disappointing, and the drug did not destroy the tissue stages of the parasite.

T. gambiense was found *in vitro* to be killed by Puromycin in dilutions of between 1 in 15,000 and 1 in 30,000 [details of time taken and of the standard of test are not given]. The drug was then tried in the treatment of 15 African patients in Portuguese Guinea, ranging from 15 to 45 years in age, and suffering from *T. gambiense* sleeping sickness. In all these cases gland puncture had yielded trypanosomes before treatment began, and in all but 4 of them blood cultures for trypanosomes were positive. The drug was given orally in capsules, each containing 250 mgm.; the daily dosages used ranged from 1·0 gm. to 2·25 gm.; the totals were 9·5 gm. to 21·0 gm. over periods of 7 to 10 days. The relevant data are set out in a table.

In 5 cases gland puncture became negative within 24 hours and in the remaining 10 it was negative within 48 hours. In 9 cases blood cultures were negative within 24 hours (but 4 of them had been negative initially), and the remainder were negative within 72 hours. All the patients were watched for 15 days; in all but one the glands and the blood cultures remained negative during this time. This single patient, who had been given a total of only 11·5 gm. of the drug, gave a positive gland and blood culture at this time. He then absconded. Another patient treated with a total of only 9·5 gm. after initially becoming negative gave a positive blood culture on the 60th day. The other patients have been watched for 6 months; so far 2 more have relapsed. The results of the Puromycin treatment of human *T. gambiense* infection therefore are encouraging, and the compound obviously merits further investigation in the treatment of sleeping sickness. Toxic manifestations amounted only to occasional headache, nausea and vomiting, and sometimes diarrhoea, which ceased when the drug was stopped.

[The antibiotic used by Porter *et al.* (*loc. cit.*), of the Lederle Laboratories, is referred to by them as Achromycin. It is stated by them to have been isolated during an antibiotic screening programme, from *Streptomyces albo-niger*. The name Achromycin was conferred on it, because in the crystalline state it was colourless. It seems that the name Achromycin after a time was withdrawn from this antibiotic (the chemical structure of which is 3-amino-D-ribose) and that this name, Achromycin, was transferred to tetracycline, an entirely different compound also made by Lederle, which was prepared by removing the chlorine atom from chlortetracycline [Aureomycin] by hydrogenation in the presence of palladium.

The Achromycin of Porter *et al.*, and of other contemporary writers, over a brief period, has been renamed Puromycin; this is the antibiotic used by the authors of the above paper. To confuse matters further the name Puromycin for this antibiotic has now been superseded by yet another name—Stylomycin. Puromycin, Stylomycin and the Achromycin of Porter *et al.* therefore are all synonyms, and refer to 3-amino-D-ribose, which is not yet commercially available; while the current, generally known, and commercially available Achromycin is in fact tetracycline.]

A. R. D. Adams

Noury, M. Infection mixte trypano-spirochétienne spontanée du lapin. [**Spontaneous Mixed Infection with Trypanosomes and Spirochaetes in the Rabbit**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 6, 788–90, 1 fig. on pl. [10 refs.]

Manso Soto, A. E. & Prosen, A. F. Estudios sobre taxonomía del *Trypanosoma cruzi*. Chagas 1909. [**Taxonomy of** *Trypanosoma cruzi*] *Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina. Publicaciones Nos. 83/84.* 1953, v. 24, 13–20. [15 refs.]

There are two conflicting views regarding the genus to which the trypanosome causing Chagas's disease should be attributed. Some authors, headed by the Brazilian protozoologist E. Dias, insist on referring it to the genus *Schizotrypanum*, while the majority retain it together with other trypanosomes in the genus *Trypanosoma*. The case for the latter was fully stated by the reviewer, whose arguments [this *Bulletin*, 1936, v. 33, 647] and classification [*ibid.*, 1933, v. 30, 778] are quoted in detail by the present authors. They express complete agreement with these views and conclude that the correct name for this parasite is *Trypanosoma cruzi*.

C. A. Hoare

Manso Soto, A. E. & Prosen, A. F. *Trypanosoma cruzi*. Chagas 1909. El cinetoplasto. [**The Kinetoplast of** *Trypanosoma cruzi*] *Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina. Publicaciones Nos. 83/84.* 1953, v. 24, 5–7, 1 coloured pl.

The authors draw attention to the confusion in the terminology of the blepharoplast and kinetoplast, and point out that the latter should be used to denote the complex consisting of the parabasal body and the blepharoplast. Although these two elements cannot be distinguished in ordinary stained blood films, in which the " parabasal " alone is visible, they can be observed separately in preparations of *Trypanosoma cruzi* in which the flagellates are

in the process of involution. In such preparations the organellae in question gradually disintegrate starting with the voluminous " parabasal." When this organelle disappears the small blepharoplast can be clearly seen as a distinct small [basal] granule at the starting point of the flagellum.

[In attempting to clarify the conception of the above organellae, the authors have unfortunately added further confusion to this question by reviving the obsolete term " parabasal " for the generally accepted kinetoplast, which is an independent organelle, associated—but not combined—with the blepharoplast.] *C. A. Hoare*

Lopetegui, R. Estudios sobre los detergentes *in vitro*. Acción del " Polisorbato 80 " sobre el *Trypanosoma cruzi*. [*In vitro* **Effect of the Detergent " Polisorbato 80 " on** *Trypanosoma cruzi*] *Universidad Buenos Aires: Misión de Estudios de Patologia Regional Argentina. Publicaciones Nos. 83/84.* 1953, v. 24, 21–6, 5 figs.

The detergent " Polisorbato 80 " is a partially esterified derivative of the anhydrides of sorbitol with oleic acid, in which the unesterified hydroxyls have been condensed with the polyoxethylenic links. It has a slight haemolytic action in a concentration of 0·1 per cent. but none at 0·01 per cent. When tested against *Trypanosoma cruzi in vitro* it produced various changes in the appearance of the flagellates, the bodies of which gradually rounded up, though they were able to survive for over 3 weeks provided the medium contained sufficient glucose for their nutrition. *C. A. Hoare*

López Fernández, J. R. & Franca Rodríguez, María E. Las modificaciones cineto-morfológicas de las formas sanguícolas de *Trypanosoma cruzi*, " in vitro " (adherencia de los tripanosomas, transformación leishmanioide e inmovilización) y su aplicación para el diagnóstico de la enfermedad de Chagas. (Nota previa.) [**The Kineto-Morphological Changes,** *in vitro*, **of the Blood Forms of** *Trypanosoma cruzi* **(Adhesion of the Trypanosomes, Changes of Shape of the Trypanosomes and Production of Leishmanioid Forms, and Loss of Motility) and their Application to the Diagnosis of Chagas's Disease**] *An. Facul. de Med. Montevideo.* 1954, Mar.–Apr., v. 39, No. 2, 233–40. English summary.

The authors have observed that, when a drop of infected murine blood is mixed with normal human serum and kept between slide and coverslip at 30–35°C., *Trypanosoma cruzi* retains its motility for 48–72 hours, in the course of which the blood typanosomes are gradually transformed into leishmanial forms. However, when a drop of blood from an infected mouse is mixed with the inactivated serum of patients suffering from Chagas's disease, two phenomena are observed: (1) the trypanosomes adhere to the erythrocytes (adhesion test or Rieckenberg's reaction) or to other particles in the preparation, and to the glass; and (2) the trypanosomes are transformed into leishmanial forms, as in the case of preparations with normal sera, but more rapidly. It is thought that the two types of adhesion are due to different antibodies, one somatic, the other flagellar.

Attempts are being made to apply the foregoing reactions for the diagnosis of Chagas's disease. *C. A. Hoare*

Pizzi P., T. & Prager S., Ruth. Estabilización de la virulencia de una cepa de *Trypanosoma cruzi* por pasaje seriado en ratones de constitución genética uniforme: análisis cuantitativo del curso de la infección. [**Stabilization of Virulence in *Trypanosoma cruzi* by Passages through Mice of Uniform Genetic Constitution: Quantitative Analysis of Course of Infection**] *Biológica*. Santiago. 1952, July–Dec., Nos. 16/17, 3–12, 8 figs. on 2 pls. & 4 graphs. [12 refs.] English summary (9 lines).

The authors point out that the experimental study of Chagas's disease is handicapped by variation in the virulence and course of infection in diverse strains of *Trypanosoma cruzi*. They sought to overcome this irregularity by stabilizing the virulence of a strain (*T*) isolated from Tulahuén bugs, *Triatoma infestans*, by means of serial passages through strain *C3H* of mice. These were obtained from Jackson Memorial Laboratories, U.S.A., in 1946, and have since been reared by inbreeding, thereby retaining pure genetic characteristics.

In the present paper an account is given of observations made on 267 animals, which were 2 months old and weighed about 18 gm. In the majority of experiments blood, taken from an infected donor mouse on the 10th day of infection, was mixed with sodium citrate (3·8 per cent.) and centrifuged, to eliminate the red cells, after which 150,000–7,000,000 trypanosomes were inoculated intraperitoneally into the recipient mice. The infection was usually allowed to run its natural course, during which the blood was examined at regular intervals. For this purpose, 5 cmm. were collected with a graduated pipette, transferred to a slide, and mounted under a square-ruled plastic coverslip, for examination and counting of the living flagellates. In a number of cases, the mice were sacrificed for histological examination and for the study of the intracellular cycle of the trypanosomes, for which stretched connective-tissue preparations (fixed with Zenker-formol and stained by Giemsa's method) were used.

By these methods strain *T* was stabilized, behaving in a uniform manner throughout the infection which is characterized as follows. The incubation period is 4–6 hours, after which scanty trypanosomes appear in the blood, remaining at a low level for 4–6 days, when parasitaemia rises abruptly and continues to increase, soon reaching a density of more than 10,000 trypanosomes per cmm. of blood. Slender forms are at first numerous but later they are gradually succeeded by transitional trypanosomes. The infected mice normally die between the 9th and 12th days. Some correlation was noted between the number of trypanosomes inoculated and the density of parasitaemia.

The development of the trypanosomes takes place in histiocytes and fixed macrophages of the connective tissue, whereas muscles are only slightly affected. After penetrating the host cell the blood trypanosomes lose their flagellum and assume leishmanial forms, which multiply repeatedly by binary fission, at a rate of one division every 12 hours. Between the 4th and 6th days the leishmanial forms are transformed into slender trypanosomes, which are released into the blood stream by rupture of the host cell. *C. A. Hoare*

Pizzi, T., Rubio, Mafalda & Knierim, Feliza. **Immunology of Chagas' Disease.** *Riv. di Parassit.* Rome. 1954, Oct., v. 15, No. 4, 577–92, 3 figs. & 2 graphs. [58 refs.]

The authors have been working for 5 years on immunity in animals infected with *Trypanosoma cruzi*, and the present paper gives a review of their results

to date. They used a reticulotropic strain isolated from *Triatoma infestans* from north Chile and maintained by blood passage every 10 days in the highly susceptible inbred strain of mice (C3H), which die with a heavy parasitaemia in 10 to 12 days. The same strain of mice was used in the experiments and its reaction was contrasted with that of the resistant A–C strain of rats. The animals were immunized in one of two ways: by 2 or 3 inoculations of cultural forms of the trypanosome which had lost their virulence by long passage in Senekjie's medium, or by inoculating virulent trypanosomes plus a suppressive drug (Primaquine). Rats can also be made immune by allowing them to recover from two parasitic crises. Acquired immunity is impaired by the administration of large doses of cortisone, which prevents full response of the reticulo-endothelial system. Ninety experiments in which 4,500 animals were used were carried out in the study of the problem. The course of the infection was evaluated in relation to (1) parasitaemia (with a pipette technique), (2) serology—precipitin tests, agglutination, complement-fixation, lysin tests and protection tests, and (3) histological picture, particularly of stretch preparations of connective tissue removed from the site of inoculation (wet-fixed in Zenker-formol and stained by the Maximow method).

By confining themselves to these strains and methods, the authors obtained very uniform results, as follows:—

(1) C3H mice, inoculated with *T. cruzi*, show few parasites in the blood for 3 to 6 days, when a sudden increase occurs; this is the result of the emergence of parasites from connective tissue cells at the site of inoculation. The next reproductive cycle (leishmanial in type as in the first) occurs mainly in connective tissue and muscle cells throughout the body. Little cellular reaction occurs and no antibodies are formed.

(2) C3H mice, inoculated with avirulent cultures, exhibit a pronounced reaction (heterophil) at the site of inoculation, which is responsible for the death of most of the trypanosomes; a few escape and give rise to a transient infection. By the sixth day antibodies appear, reach a peak by the 14th day and then decline.

(3) C3H mice, inoculated with *T. cruzi* and given Primaquine, show a feeble infection, accompanied by phagocytosis but by no antibody production.

(4) Immunized C3H mice, inoculated with *T. cruzi*, show a rapid phagocytic (lymphoid polyblast series) response at the site of inoculation, and a rise in titre of antibodies.

(5) Young A–C rats, inoculated with *T. cruzi*, develop a parasitaemia which reaches a crisis in about 8 days; a second crisis occurs fairly constantly about the 20th day. The lymphoid macrophage response is particularly marked during this second crisis, and antibodies can be detected in a high titre. Parasites become scarce after the second crisis, but a diffuse myocarditis (as in human infections) may arise, which is probably the result of hypersensitivity. In older rats the parasite rarely gets a hold; it is destroyed by phagocytes at the site of inoculation, and the animal reacts like (2) or (4) above. [This paper is a useful summary of work still going on. One hopes that the reaction of similar groups of animals will be observed in relation to inoculation of metacyclic trypanosomes of the same strain from reduviids.]

[See also this *Bulletin*, 1955, v. 52, 347, 348.] *P. C. C. Garnham*

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

Corradetti, A. & Neri, Italia. Un focolaio di kala azar sul Monte Argentario (Costa Tirrenica Toscana). [**A Focus of Kala Azar in the Monte Argentario Region, Tyrrhenian Coast of Tuscany**] *Riv. di Parassit.* Rome. 1954, Oct., v. 15, No. 4, 353–6, 1 map.

The English summary appended to the paper is as follows:—

"At Porto Santo Stefano (Monte Argentario Tyrrhenian Coast of Tuscany) about 20 cases of infant kala azar occurred between 1943 and 1952. Phlebotomus catches made in different localities of the Monte Argentario during the years 1953 and 1954 gave the following results: out of 1,554 phlebotomus captured, 1,547 were *Ph. perniciosus*, 6 *Ph. papatasi* and 1 *Ph. minutus*. Therefore Monte Argentario appears to be a typical zone of infant kala azar as well as the Vesuvius and Etna zones."

Simitch, T., Gvozdenovitch, M. & Nevenitch, V. Peut-on considérer le chien comme réservoir d'infection pour l'homme par le kala-azar, dans toutes les régions de la Yougoslavie où cette maladie est endémique? [**Should the Dog be regarded as a Reservoir of Human Kala Azar in all Endemic Areas in Yugoslavia?**] *Bull. Acad. Serbe des Sci.* Belgrade. 1954, v. 11 (n.s.), Classe Sci. Méd., No. 2, 42–3.

Kala azar is endemic throughout Yugoslavia, except in Slovenia, and the distribution of the disease corresponds with that of 5 species of *Phlebotomus*, which vary in their grouping in the different areas of the country.

The authors quote figures from a number of surveys to show that in the regions near the Adriatic (Dalmatia, Montenegro and Istria) kala azar occurs both in man and dogs. On the other hand, canine infection is absent or rare in Serbia and Macedonia even where the disease is common in man. From the results examined the authors conclude that in Serbia and in most of Macedonia the dog is not a reservoir of kala azar infection in man.

H. J. O'D. Burke-Gaffney

Pifano C., F. Estado actual del kala-azar en Venezuela. [**Current Position of Kala Azar in Venezuela**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1954, Mar., v. 2, No. 2, 213–19.

The English summary appended to the paper is as follows:—

"A revision has been made of the status of Kala-azar in Venezuela with an analysis of the observations already published. Of a total of 14 cases which have been diagnosed up to the present time in this country, 11 of these patients have been children and 3 adults. From a clinical point of view, two types of Kala-azar are observed in the Neo-tropical region: (1) patients in whom the symptoms of acute infection develop more or less rapidly, dying within a period of three to six months; and (2) patients in whom the symptoms of chronic infection prevail, the initial phases and the illness have a prolonged evolutive tendency, lasting sometimes one to two years and other times more. As to the rest, the clinical picture is similar to the one observed in visceral Leishmaniasis in other continents: fever, anemia with leucopenia and lympho-monocytosis, progressive splenomegalia, hepatomegalia, losing of weight and cachexia. The dog and cat are natural reservoirs

of Leishmania donovani in Brazil, but up to the present none have been found infected in Venezuela. In areas where Kala-azar existed Phlebotomus panamensis has been found, which is the vector of tegumentary Leishmaniasis in the country. An evaluation of the problem of Kala-azar in Venezuela and in other countries in America is lacking because of the absence of well conducted epidemiological surveys."

FEVERS OF THE TYPHUS GROUP

In this section abstracts are arranged as far as possible in the following order:—general; louse-borne typhus, flea-borne typhus, mite-borne typhus; rickettsialpox; tick-borne typhus; Q fever, other rickettsial diseases.

PRICE, W. H. **Studies on the Interepidemic Survival of Louse Borne Epidemic Typhus Fever.** *J. Bacteriology.* 1955, Jan., v. 69, No. 1, 106–7.

The author describes the isolation of *Rickettsia prowazeki* from two persons who had emigrated from Russia to the U.S.A. more than 20 years previously. Both had complement-fixing antibodies for *R. prowazeki* at a titre of 1 in 10 for 14 months before the isolation. Small portions of lymph nodes were incubated in tissue-culture media for 10 days; suspensions of the cultures were then inoculated intraperitoneally into cotton rats, brain suspensions of some of which were inoculated into chick yolk sacs and in smears of these typical rickettsiae developed. Other inoculated rats were found immune to *R. prowazeki* in doses of 2 to 4 LD50 but were susceptible to *R. mooseri.* White mice immunized with *R. prowazeki* were protected against challenge with the 4th yolk-sac passage of the strain, but mice immunized with *R. mooseri* showed no immunity. Guineapigs inoculated with brain suspensions of the infected cotton rats gave a 10-fold higher complement-fixation titre against *R. prowazeki* than against *R. mooseri.*

The author states that the problem awaiting solution is the mechanism that causes recrudescence of the illness in human reservoirs of infection. He promises a paper by himself and other workers in which extensive attempts to cause recrudescences in human beings by daily injections of 50·0 mgm. of cortisone or 20 units of corticotrophin for a period of 3 weeks gave negative results. *John W. D. Megaw*

SUZUKI, T. **Studies on the Bionomics and Chemical Control of Tsutsugamushi (Scrub-Typhus Mites). Part I. *Trombicula akamushi* (Brumpt) in Northwestern Honshu, Japan.** *Japanese J. Exper. Med.* 1953, Dec., v. 23, No. 6, 487–516, 4 figs. [47 refs.]

The results of field and laboratory studies on the bionomics, distribution and chemical control of *Trombicula akamushi* (Brumpt) are reported. These investigations were carried out during the summers of 1952 and 1953 in an endemic focus along the Omono River in north-western Honshu.

Trials of several methods of collecting unengorged larvae from the soil surface, for population studies, indicated that black bakelite plates 15 cm. square were convenient and efficacious for *T. akamushi*, although of little use

for the larvae of *T. pallida* occurring in the same area. The author emphasizes that the distribution of larval populations assessed by the plate method can only be reliably compared from area to area for single species, and not for comparisons between different species.

The rate of larval movement on the bakelite plates was found to be 7·2 cm. per minute at 22·8°C., and it is stated that the unengorged larvae of *T. akamushi* exhibited some degree of negative geotaxis on a vertical surface, although their movements were largely random.

The author notes that the temperature of the atmosphere and of the soil surface during these investigations could not be associated with any variations of population density during the period July to September; mites were even seen to crawl on to the bakelite plates at a temperature of 40°C. in direct sunlight.

The local distribution of the larval population was assessed by sampling on the basis of a grid system, and the data obtained indicate that the distribution of mites could be loosely correlated with the location of vole burrows in the area investigated where such burrows were situated on the flanks of low, bushy hillocks, which were separated by low-lying areas of grasses. The highest larval densities were found to coincide with the edges of the low-lying grassy patches between the hillocks.

The effect of a minor flood on the larval population was found to be small; but after a more severe flood (which resulted in complete inundation of the area, and the deposition of a thick layer of mud) the larval population fell rapidly to almost zero.

Field tests of mite repellents such as benzylbenzoate, dibutylphthalate, and dimethylphthalate showed a decreasing degree of potency in the order given, and seemed to be more strictly miticidal in action, rather than truly repellent, when tested by skin application or by cloth impregnation, and their value in the field is decreased owing to the necessity for repeated application at intervals of a few hours. In tests with cloth-impregnation, lindane [BHC] emulsion was found to be by far the most successful.

Experiments on area control by BHC dusts (containing 3 per cent. of the gamma isomer) and lindane dust (containing 1 per cent. gamma BHC), were carried out with a small dusting machine, and showed that the application of either chemical, at a rate of 5 lb. of active ingredient per acre, was effective in securing complete eradication for periods of about 16 days. Emulsions, or kerosene solutions, of lindane were also effective, but more troublesome to apply, and also damaged the vegetation to some extent.

D. M. Minter

Kawamura, A., Jr. **Notes on the New Strain of *Rickettsia*, *Rickettsia tamiyai* n. sp., isolated from Voles in Hokkaido.** *Japanese J. Exper. Med.* 1954, Feb., v. 24, No. 1, 47–50. [10 refs.]

In the course of a systematic survey of the distribution of tsutsugamushi infection among voles in Japan the authors isolated two strains of rickettsiae by intraperitoneal inoculation of mice with suspensions of liver and spleen of two separate pools of voles from Sapporo.

The rickettsiae were regarded as differing from *Rickettsia orientalis* [*R. tsutsugamushi*] in the following respects: (a) no eschar was produced at the site of inoculation intracutaneously of man, rabbit or monkey; (b) pathogenicity to rabbits was less pronounced; (c) the Weil-Felix reaction in man, monkey and rabbit inoculated with the strain was positive with *Proteus OX2* as well as with *P. OXK*; (d) cross-immunity tests against standard strains of *R. orientalis* gave negative results; (e) complement-fixation tests of sera

of infected persons and animals were negative with Ozeki and Gilliam strains of *R. orientalis*; (f) antigens prepared from the organisms gave negative results in complement-fixation tests of sera of persons and animals infected with several strains of *R. orientalis*.

The strains were also differentiated from *R. prowazeki*, *R. typhi* [*R. mooseri*], *R. akari*, *Coxiella* [*Rickettsia*] *burneti*, and vole rickettsiae. The name *Rickettsia tamiyai* has been given to the strain.

[The author is aware of the pronounced antigenic differences that exist between various strains of *R. tsutsugamushi*. In view of these differences workers on the rickettsiae will probably demand more detailed information on the experiments on which the above differential features are based.]

John W. D. Megaw

Babudieri, B. Reazione di deviazione del complemento e reazioni di agglutinazione nell'infezione da *Coxiella burnetii*. [**Complement Deviation Reaction and Agglutination Reactions in *Coxiella burneti* Infection**] *Rendiconti Istituto Superiore di Sanità*. Rome. 1954, v. 17, Pt. 11, 982–5. English summary (5 lines).

The author describes in general terms the results of comparative trials of three serological tests for Q fever; these were the complement-fixation and two agglutination tests, one of which was microscopic, the other macroscopic. Details of the results and of the special technical methods employed are not given. Altogether, 420 human and 248 animal sera were tested. The complement-fixation reaction appeared earlier and was less persistent than the agglutination reactions. The microscopic agglutination test was two to three times more sensitive than the macroscopic. One case is mentioned in which the complement-fixation and the author's modification of the microscopic test reacted at 1 in 128, as compared with a titre of 1 in 3 for the macroscopic test.

It is recommended that the complement-fixation and microscopic agglutination tests should be carried out in every case.

John W. D. Megaw

Mika, L. A., Goodlow, R. J., Victor, J. & Braun, W. **Studies on Mixed Infections. I. Brucellosis and Q Fever.** *Proc. Soc. Exper. Biol. & Med.* 1954, Dec., v. 87, No. 3, 500–507, 1 fig.

This work arose from an observation by Lennette *et al.* [this *Bulletin*, 1952, v. 49, 500] who found, in a livestock raising area, an unexpectedly low frequency of *Brucella* agglutinins in persons whose sera contained complement-fixing antibodies to *Rickettsia burneti*. This suggested a possible interference phenomenon. The present authors investigated this by infecting guineapigs with both *R. burneti* and *Br. suis* by parenteral or respiratory routes, with the use of different dosages and different intervals between the two infections.

When sublethal dosages of the rickettsia were inoculated intraperitoneally on the same day as the brucella was injected subcutaneously, the animals developed a double infection, but there was some interference with the establishment of the rickettsia as judged by the serological response of guineapigs receiving spleen emulsions from the primarily infected animals. When the respiratory route was used, there was similarly a reduced persistence of the rickettsia, and a less severe infection, in the animals receiving *Br. suis* at the same time.

With lethal dosages of rickettsia, the interference effect was also observed. For instance, of a group of guineapigs infected with *Br. suis* subcutaneously, half survived an otherwise lethal dosage of *R. burneti* given intraperitoneally 28 days later.

The interference phenomenon could not be related to demonstrable immunological factors. It was observed in animals at a stage when their sera showed no brucella agglutinins and no rickettsial protective antibodies.

J. C. Cruickshank

Giroud, P. Comparaison de l'action anti-rickettsienne du 533$_7$ RP ou spiramycine avec celle de l'auréomycine et de la terramycine. [**Comparison of the Anti-Rickettsial Action of 533$_7$ RP or Spiramycin with that of Aureomycin or Oxytetracycline**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 5, 642–4, 1 fig.

This paper briefly reports a study of the action of a new antibiotic, Spiramycin, on the lesions produced in rabbits by injecting rickettsial suspensions in different quantities intradermally. The nodules produced are measured and their volume calculated daily for 12 days: curves representing these for an inoculum of 3 different sizes in controls and in rabbits treated with three antibiotics represent the results of the work described. The size of the lesions was considerably diminished by treatment with Spiramycin [the curves show an initial diminution and a secondary increase in size to which no reference is made in the text]. Aureomycin (chlortetracycline) had a similar degree of effect, and Terramycin (oxytetracycline) a decidedly greater one, but the latter is said to be much more toxic [particulars of the evidence on which this statement about toxicity is based are not given]. There are also a few data about antibody formation, which appears to be diminished in proportion to the diminution in size of the lesion.

L. P. Garrod

DENGUE AND ALLIED FEVERS

Eklund, C. M., Kohls, G. M. & Brennan, J. M. **Distribution of Colorado Tick Fever and Virus-Carrying Ticks.** *J. Amer. Med. Ass.* 1955, Jan. 22, v. 157, No. 4, 335–7, 2 figs.

In a survey of the distribution of Colorado tick fever the authors found that its range of distribution was much wider than had been known. Since 1952 sera sent for investigation at the Rocky Mountain Laboratory from all patients who had been exposed to bite by ticks were tested for the presence of the virus of the disease; previously the test was carried out only when asked for. In 1952 the virus was isolated from 42 patients whereas in previous years the greatest number of positives had been only about one-eighth of this number. In the two following years the positives were 44 and 86 respectively. In the States of Idaho and Nevada, from which no cases had previously been reported, the numbers of isolations during the three years 1952–54 were 54 and 34, respectively, against 30 in Colorado which had previously contributed the largest number of cases. The other States found infected were as follows (the figures in brackets show the number of cases during 1952–54): Montana (15); Oregon (22); Wyoming (13); Utah (4); Washington (1); and California (1).

All the patients had been infected in the area of known distribution of *Dermacentor andersoni* and the seasonal occurrence corresponded with the months during which adult ticks of this species are active and are the only ticks which commonly attack men. In every area in which the disease occurs and in which attempts have been made to isolate infection from *D. andersoni* the virus has been found among these ticks. In 10 out of 11 localities in Colorado and Nevada from 1·0 to 14 per cent. of the ticks were estimated as having been infected, judging by the number of pools, of 20 ticks each, which were found to contain infection in each locality. The virus in rare cases was found in ticks of other species but everything pointed to *D. andersoni* as the only important vector. The virus could not be isolated from any of 652 *D. variabilis* collected from Long Island where Florio *et al.* reported the isolation of 3 strains of the virus from this tick [see this *Bulletin*, 1950, v. 47, 978].

Although the disease was ordinarily benign and dengue-like, encephalitis was reported to have occurred in 4 children and meningitis in another; one of the children was said to have been comatose and two others to have been delirious.

[It is interesting to find that Colorado tick fever remained undetected so long in places not far from Colorado where it was first described by Becker in 1926. Much the same thing happened in connexion with Rocky Mountain spotted fever. It seems possible that the place-names given to both diseases may have conveyed the misleading suggestion that their distribution was likely to be restricted to the neighbourhood indicated by their names.]

John W. D. Megaw

RABIES

Paarmann, E. Die Färbung Negrischer Körperchen mit Rhodamin B. [**Staining of Negri Bodies with Rhodamine B**] *Zent. f. Bakt.* I. Abt. Orig. 1954, v. 161, Nos. 7/8, 546–8.

Very thin pieces of fresh tissue are fixed in 5 per cent. glacial acetic acid in equal parts of acetone and methyl alcohol for 1 hour, transferred to equal parts of benzene and the acetone-alcohol mixture for ½ hour, and thence to benzene and paraffin wax. Sections are treated with xylene to remove wax, taken down to 50 per cent. methylated spirit, and stained for 2–4 seconds in 1·5 per cent. Rhodamine B; they are then rinsed in tap water, immersed for less than 2 seconds in 0·05 per cent. methylene blue, rinsed in tap water and gently dried with filter paper. Differentiation and dehydration are then carried out by rapidly passing the sections through acetone, xylene in acetone (30 per cent. followed by 50 per cent. and 90 per cent.) and xylene, and the sections are then mounted in balsam. The Negri bodies are stained red with a clear centre.

For successful differentiation the sections must not be too dry, and it is sufficient to touch them lightly 3–4 times with fresh pieces of filter paper. Smears are stained similarly, but are differentiated in 0·5 per cent. glacial acetic acid in acetone, and acetone containing 0·1 per cent. of 50 per cent. aqueous potassium hydroxide, followed by 30 per cent. xylene in acetone and the other solutions as used for differentiating sections. *D. J. Bauer*

Ramon, G. La lutte contre la rage chez les animaux et chez l'homme. Mesures sanitaires et vaccination. [**Control of Rabies in Animals and Man. Health Measures and Vaccination**] *Rev. d'Immunologie.* 1955, v. 19, Nos. 1/2, 1–26. [Refs. in footnotes.]

A general review and discussion.

Field, E. J. **Pathogenesis of Rabies following Corneal Inoculation in the Rabbit.** *J. Path. & Bact.* 1954, Oct., v. 68, No. 2, 335–43, 13 figs. on 3 pls. [42 refs.]

"Following corneal inoculation of fixed rabies virus in the rabbit, encephalitis develops with considerable regularity on the sixth to the eighth day. The outstanding early clinical features are hypotonia and disturbance of equilibration, most marked in the hind limbs. Infiltration of the ipsi- and contralateral Gasserian ganglia occurs early, and in diminishing degree spreads down to the other sensory ganglia.

"The microglia reacts early in the pons, cerebellum and cerebrum and presents distinct alterations at a time when the nerve cells seem normal or only minimally affected. This early microglial reaction suggests a rapid interstitial diffusion of virus in the neuraxis independently of nervous connections.

"The possibility of blood and cerebrospinal-fluid dissemination of the virus is discussed. No direct evidence of axonal transmission was found."

PLAGUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

Berke, Z. **Plague Conference in Tehran. Epidemiology of Plague in Turkey. Plague Epidemics of Syria, Irak and Iran.** *Türk. Ijiyen ve Tecrübî Biyoloji Dergisi.* Ankara. 1954, v. 14, No. 3, 95–116. [Fuller version in Turkish 65–94, 2 maps.]

In this paper the epidemiology of plague in Turkey is described and there are short notes on epidemics of the disease in Syria, Iraq and Iran.

In the years 1919 to 1929 there were epidemics or small outbreaks of plague every year in Istanbul, and a few isolated cases occurred in 1926, 1928 and 1929 in the Turkish port of Antalya. Most of the cases in these places occurred among workers in the port areas and the circumstances pointed strongly to infected ships as the sources of infection.

In 1947 an epidemic occurred in 2 villages of the Akçakale district [this *Bulletin*, 1955, v. 52, 446] which is situated far inland, close to the Syrian border. There were 22 cases with 16 deaths; 6 of the cases were septicaemic, the other 16 were bubonic, with localization of the buboes in the armpit in 10 cases, in the groin in 5 and in the neck in 1. There was no evidence of importation of infection by sea and the environmental circumstances pointed strongly to wild rodents as the original source of infection; the people of the infected villages had close contacts of various kinds with these. The bacilli

isolated from the patients were glycerin fermenters and therefore of the type called "continental" or "mediaeval" whereas the strains isolated in Istanbul and Antalya were glycerin-negative and so of the "oceanic" or "oriental" type.

Energetic measures were taken to control the outbreak in Akçakale; these included the extermination of rats and their fleas, disinfection and vaccination. The author claims that these were responsible for bringing the epidemic to an end within 2 months. Extensive measures of control of wild rodents are still being carried out for economic reasons in places where they are numerous; grain poisoned with strychnine is used for ground squirrels and sulphate of thallium for field mice.

A short summary is given of the epidemiology of wild-rodent plague in the adjoining countries of Iran, Iraq and Syria; in Turkey and these countries is included the territory formerly known as Kurdistan in which devastating epidemics of plague occurred from 1830 to 1835, and seeing that the climatic conditions, the fauna and flora of this region still remain the same it is evident that constant vigilance is needed to prevent the spread of infection among domestic rodents, when, as occasionally happens, the constantly lurking wild-rodent infection spreads to them.

A note is added on the prevalence of distribution of the wild rodents of Turkey. Reference is made to the work of Baltazard *et al.* whose important papers on wild-rodent plague in Kurdistan have already been reviewed [this *Bulletin*, 1952, v. 49, 1041; 1953, v. 50, 26; 1954, v. 51, 174].

John W. D. Megaw

Slein, M. W. **Xylose Isomerase from** *Pasteurella pestis*, **Strain A-1122.** *J. Amer. Chem. Soc.* 1955, Mar. 20, v. 77, No. 6, 1663–7, 7 figs. [Refs. in footnotes.]

Ransom, J. P., Quan, S. F., Hoggan, M. D. & Omi, G. **Antigenic Comparisons of Strains of** *Pasteurella pestis*. *Proc. Soc. Exper. Biol. & Med.* 1955, Feb., v. 88, No. 2, 173–6, 3 figs. [16 refs.]

This is a description of a method by which different strains of *Pasteurella pestis* can be classified in groups in accordance with certain antigenic features which can be seen and compared in a special apparatus called the antigen comparator cell. It has been found that when a suspension of *P. pestis* is floated on a solidified mixture of anti-plague serum and agar the antigens contained in the suspension gradually penetrate the agar mixture and in doing so produce visible zones of precipitation which vary in number and pattern in accordance with the variations which occur in the antigenic fractions possessed by the strains employed. For the purpose of comparison the reaction is carried out in a 2-chamber modification of the 4-chamber antigen-comparator cell originally described by Surgalla *et al.* [*Bull. Hyg.*, 1953, v. 28, 141]. The lower part of this cell is filled with the warmed agar-antiserum mixture up to the lower border of a partition which divides the upper part of the cell into two chambers, so that when the agar-antiserum mixture solidifies it forms a floor for each. Thus, the antigenic suspensions to be compared can be introduced into the chambers without coming into contact with each other. If the antigenic fractions of the two strains are identical the zones of precipitation formed in the agar mixture lying beneath each chamber will be similar and will run into each other as can be observed and photographed through the transparent walls of the cell. Differences in the number and pattern of these zones form the basis of classification of the

strains. The cell is kept at 30°C. and readings are made after 3 and 7 days.

Five strains were tested with the same antiserum-agar mixture and were found to fall into 3 groups of which Group I comprised 2 virulent and 1 avirulent strain, Groups II and III were represented by 1 avirulent strain each.

A sketch with measurements is given of the cell and the findings are illustrated by two photographs. *John W. D. Megaw*

Goodner, K., Pannell, Lolita, Bartell, P. & Rothstein, E. L. **Toxic End Products from *Pasteurella pestis*. I. A Comparison of Lysate Toxin with that obtained from the Action of Bile Salts.** *J. Infect. Dis.* 1955, Jan.–Feb., v. 96, No. 1, 82–7. [10 refs.]

The addition of bile salts, especially sodium desoxycholate, to suspensions of *Pasteurella pestis* was found to cause a great increase in the toxicity of the end product for mice. After the addition of the salt in suitable quantities the dissolution of the bacterial cells in the suspension occurred in two phases; within the first 10 minutes or so there was rapid lysis of the cells as was shown by a 25 per cent. reduction in the turbidity of the suspension; then there was a pronounced slowing of the process of lysis so that a 50 per cent. reduction of turbidity was not reached till about 50 minutes later. In suspensions to which the bile salt was not added the lytic process was much slower and by the end of 60 minutes the turbidity had been reduced by only about 2·0 per cent. The increased toxicity of the treated suspension was partly explained by the greater lysis of the bacterial cells, but it was found that an autolysate freed from cells became as much as 10-fold more toxic after the addition of 1·0 per cent. of sodium desoxycholate. The additional toxin produced in this way was much more labile than the toxin resulting from ordinary lysis. Rabbits inoculated with avirulent strains of *P. pestis* developed high antitoxin levels against the labile toxin whereas rabbits immunized against the ordinary lysate toxin developed a "fair" antitoxin level against the homologous toxin but only a little antitoxin against the labile desoxycholate toxin.

It appears that preparations of the ordinary lysate toxin may contain only a little of the highly labile toxin, which, therefore, may be immunologically distinct from the lysate toxin. *John W. D. Megaw*

McCrumb, F. R., Jr., Mercier, S., Chen, T. H., Meyer, K. F. & Goodner, K. **Studies on the Antibody Patterns in Pneumonic Plague Patients.** *J. Infect. Dis.* 1955, Jan.–Feb., v. 96, No. 1, 88–94. [19 refs.]

The authors have taken advantage of the recently offered opportunity of studying the production of antibodies in pneumonic plague among patients in Madagascar who recovered because of treatment with the modern broad-spectrum antibiotics [see this *Bulletin*, 1953, v. 50, 933].

The sera of 8 patients were tested for the presence of neutralizing antibodies at 3 stages of their illness (a) on the 2nd to the 6th day; (b) on the 11th to the 18th day; and (c) on the 30th to the 37th day. In all but one case there was an increase in the antitoxin during convalescence, though the rise in the neutralizing index was never greater than 3-fold. Sera of 15 patients were tested by agglutination and complement-fixation methods and 9 had demonstrable antibody which usually appeared between the 7th and 14th days at titres which were comparable with both methods; with

the haemagglutination method the titres were usually 20 to 40 times higher than with the other two methods, and sera of 3 patients which were negative with the other methods reacted with the haemagglutination test which failed to give a positive reaction in only one case in which the treatment by chloramphenicol was started as early as 3 hours after the onset.

Tests for mouse-protective antibodies carried out in 5 cases during the acute stage gave negative results; in early convalescence 6 of 12 sera showed significant degrees of protection and in later convalescence 7 of 8 sera were highly protective.

No evidence could be obtained to support the suggestion that influenza or atypical pneumonia viruses or streptococcus MG acted in association with *P. pestis* in the production of pneumonic plague. The experiments demonstrated the presence of antibodies against the envelope substance and the toxins of *P. pestis*. *John W. D. Megaw*

Thal, E. & Chen, T. H. **Two Simple Tests for the Differentiation of Plague and Pseudotuberculosis Bacilli.** *J. Bacteriology.* 1955, Jan., v. 69, No. 1, 103–4.

The authors describe two simple tests which they have found uniformly satisfactory in differentiating 204 strains of pseudotuberculosis bacilli from 50 strains of plague bacilli. One of the tests is based on the proposal of Fauconnier (*Ann. Inst. Pasteur*, 1950, v. 79, 104) to use urea.

The authors used ordinary urea (Difco) slope cultures with phenol red as the indicator. All the pseudotuberculosis strains produced red coloration, showing the production of urease; the 50 plague strains showed no coloration.

The authors state that the recent work of Devignat [see this *Bulletin*, 1954, v. 51, 1059] is in accord with their findings.

In the second test desoxycholate citrate agar was used. This had already been recognized as a medium for the isolation of enteric organisms by Leifson [*Bull. Hyg.*, 1935, v. 10, 605]. It facilitates the cultivation of the pseudotuberculosis bacillus from contaminated material.

Pasteurella pestis grows on the medium scantily in reddish pin-point colonies. *P. pseudotuberculosis* grows abundantly in large opaque colonies which, like the culture medium, have become yellow after 48 hours' growth at 37°C. *P. pestis* was cultivated in the same conditions.

John W. D. Megaw

Schar, M. & Thal, E. **Comparative Studies on Toxins of** *Pasteurella pestis* **and** *Pasteurella pseudotuberculosis.* *Proc. Soc. Exper. Biol. & Med.* 1955, Jan., v. 88, No. 1, 39–42, 1 fig. [15 refs.]

In this comparative study of the toxins of *Pasteurella pestis* and *Pasteurella pseudotuberculosis* an avirulent strain of *P. pestis*, EV76 (Girard and Robic) and strains of *P. pseudotuberculosis* were the sources of the toxins. Antitoxic sera for these toxins were prepared. Mice and rats were very susceptible to the toxins of both organisms; rabbits and guineapigs were refractory to the toxins of *P. pestis* but were readily killed by the toxin of *P. pseudotuberculosis*. The action of plague toxin on rats was a fall of blood pressure associated with haemoconcentration; pseudotuberculosis toxin had neither of these effects. Rabbits could be immunized against multiple lethal doses of pseudotuberculosis toxin by inoculation with the organism, and neutralization of the toxin, both *in vivo* and *in vitro*, could readily be effected. The serum of rabbits that had been immunized with plague toxin was only slightly protective to mice against injections of

the toxin; not more than 3 mouse-LD50 given intravenously could be tolerated. It appeared, therefore, that the toxins of the strains of *P. pseudotuberculosis* tested in these studies fulfilled the requirements of a true exotoxin as defined by Topley and Wilson and other experts. The immunological properties of the plague toxin did not conform to these requirements. No cross-immunity between the two toxins was observed.

John W. D. Megaw

CHOLERA

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Jude, A. & Gallut, J. Contribution à l'étude de la virulence et du pouvoir toxigène du vibrion cholérique: I. Influence de la température d'incubation sur la virulence expérimentale de *Vibrio cholerae* (Ogawa). [**Studies on Cholera Toxin: Influence of Incubation Temperature on the Toxicity of Cultures of *V. cholerae* (Ogawa)**] *Ann. Inst. Pasteur.* 1955, Feb., v. 88, No. 2, 145–52, 1 fig. [12 refs.]

Gallutt [this *Bulletin*, 1954, v. 51, 1060] has shown that the toxicity of *Vibrio cholerae*, as estimated by its LD50 for white mice, varies during the course of the disease, and that the most toxic vibrios are isolated about the sixtieth hour, *i.e.*, during the choleraic state, always accompanied by a fall of body temperature. This suggests that *V. cholerae* may produce more toxin below the normal human temperature than at 37°C. The authors have examined this possibility by measuring the LD50 of cultures of *V. cholerae* grown at 18°, 37°, and 41·5°C.

Five strains of *V. cholerae* (Ogawa) were used. One of them, HI 41, was a strain from the Haffkine Institute, Bombay, where it had been maintained for several years. The other strains B 143, B 24, B 113 and B 144, were isolated at Calcutta in February, 1953, and had undergone only a few passages on artificial media. The vibrios were grown on nutrient agar (*p*H 7·5), suspended in 0·9 per cent. saline, and 0·5 cc. of suspension was injected intraperitoneally into white mice of 18–20 gm. weight. The number of organisms in the suspension was determined by measuring the density of the suspension by an electrophotometer, and transforming the reading obtained into numbers per cc. by a calibration curve. The inoculated animals were observed for 4 days, and the LD50 calculated by the method of Bonét-Maury *et al.* [*Bull. Hyg.*, 1954, v. 29, 863]. There was no obvious difference in the amount of growth at the different temperatures, and no S⟶R dissociation was observed.

The results are shown in 5 tables. For each of the 5 strains studied the smallest LD50 was always obtained with the culture incubated at 18°, the greatest with the culture incubated at 41·5°. Cultures grown at 37° were intermediate, except HI 41 the LD50 of which was the same at 37° as at 41·5°.

Repeated subcultures of three strains at 37° resulted in a three-fold to four-fold loss of virulence. Virulence lost in this way could not be wholly restored. Strain B 144 after 4 passages at 41·5° and then subjected to 2 passages at 18°, had its original LD50 increased from $1{\cdot}6 \times 10^8$ at 18° to $3{\cdot}5 \times 10^8$, and to $2{\cdot}7 \times 10^8$ after 11 passages.

The virulence of *V. cholerae* for the white mouse depends then on the temperature of incubation. The maximum virulence is obtained at 18°. At 37° virulence is progressively lost with each subculture and at 41·5° there is a marked and rapid loss of virulence, which, however, can be regained to a certain extent by subsequent passages at 18°. Cross-absorption agglutination tests were carried out to see if variations in the temperature of incubation modified the antigenic structure of the vibrio. No significant alterations in titre were observed and no evidence was obtained to show that virulence depends on the appearance of an antigen elaborated as the result of temperature. It would appear that the virulence of *V. cholerae* depends on the toxicity and not on an antigen similar to the Vi antigen of *Salm. typhi*.

C. C. B. Gilmour

Gallut, J. & Jude, A. Contribution à l'étude de la virulence et du pouvoir toxigène du vibrion cholérique. II.—Influence de la température d'incubation sur le pouvoir toxigène *in vitro* de *Vibrio cholerae* (Ogawa). [**Studies on Cholera Toxin. The Influence of Temperature of Incubation on the Toxigenic Power** *in vitro* **of** *Vibrio cholerae* **(Ogawa)**] *Ann. Inst. Pasteur.* 1955, Mar., v. 88, No. 3, 282–8, 1 fig.

In a previous paper [see above] the authors have shown that the virulence of *Vibrio cholerae* depends on its toxicity which is related to the temperature at which the culture is incubated, and not to any modification of its antigenic structure. Vibrios of strain HI 41 were grown at three temperatures, 18°, 37°, and 41·5°C., killed by heating at 100° for 5 minutes and inoculated into white mice. The LD50 of these cultures was 9×10^9 at 18°, 14×10^9 at 37°, and $13{\cdot}6 \times 10^9$ at 41·5°. Though these results are not statistically significant the lowest fatal dose is that of the culture at 18°. As it was possible that heating might have destroyed a thermolabile fraction of the toxin a study of the whole toxin was made.

Strain B 144, one of the 50 strains of *V. cholerae* isolated by Burrows and Lankford in Calcutta in 1953 [this *Bulletin*, 1954, v. 51, 1060], was chosen because it had been isolated from the only fatal case in their series, and had proved the most virulent (LD50 at 18° being $1{\cdot}1 \times 10^8$) of the 5 strains studied in the previous paper. It is a typical *V. cholerae* of Ogawa type, smooth, and showing no tendency to S→R variation at the three temperatures of 18°, 37°, and 41·5°C. The vibrios were grown on peptone agar for 16 to 18 hours and then suspended in 0·5 per cent. glucose saline. At 37° all the glucose is consumed by the end of 4 hours and the *p*H has fallen to 5·8, a degree of acidity sufficient to kill all the organisms. This is also the case at 41·5°. At 18°–20° cultures have to be incubated for 36 to 40 hours to get a yield equal to that at 37° and fermentation is also retarded so that traces of glucose remain even after 28 hours. The titration of cultures at 18°–20° was therefore carried out after 20 and 40 hours' fermentation.

Twelve preparations of toxin were studied. Each cc. contained the toxin of 800×10^9 vibrios. Five were prepared at 18°–20°, 1 after 20 hours, 2 after 24 hours, 1 after 28 hours, and 1 after 40 hours, from strain B 144 constantly kept, from its arrival at the laboratory in May 1953, at 18°–20° either as a lyophilized culture or in a deep stab in a sealed tube in the dark and never subcultured. Three toxins were prepared at 37° after 4 hours' fermentation, the first on receipt of the strain, the second after 56 days, also in the above conditions, and the third after 30 days of daily subculture in peptone water. Two toxins were prepared from the lyophilized strain cultivated in peptone water for 30 and 60 days respectively at 37°, the first with 30 and the second with 55 subcultures. Two toxins were prepared at

18°–20° after 24 hours' fermentation from the lyophilized culture after it had been subcultured at 41° daily in peptone water for 30 days and then at 20° with daily subculture for 7 and 25 days respectively. The details of these toxins are given in a table with the results of titration, which was carried out by the method of Maury *et al.* [*Bull. Hyg.*, 1954, v. 29, 863] with 24 white mice in 4 batches, each receiving a different dose, but in some cases 48 mice in 6 batches were used. The titre was calculated in LD50 per cc.

The results are given in a table and figure. The average titre of the toxins formed at 18°–20° was 50·1 LD50 per cc., at 37° the average titre was 18·3 and at 41° it was 3·5. The vibrios grown at 41° for 30 and 60 days and then at 20° for 7 and 25 days had a titre of 6·8 in each case. The results on each of the 4 groups show no great variation among the toxins produced in the same conditions, and the storage of the strain for up to 326 days in the laboratory has had no influence on them. The differences in titre between toxins prepared at 20° and 37° and between 37° and 41° are obvious and between 20° and 41° are statistically significant. If the titre of the toxin produced by B 144 at 37° is taken as a standard then the same number of organisms at 20° will produce a toxin 2·73 times stronger and at 41° 5·2 times weaker. If the standard is taken at 41° then the toxin at 37° is 5·2 times stronger and at 20° is 14·3 times stronger. It would appear that if the lowest temperature is indeed favourable to toxin production it can only partly counteract the unfavourable effect of growth at a higher temperature, for culture at 41° for 30, or 60, days followed by subculture at 20° for 7, or 25 days, gives a coefficient of increase in toxicity of only 1·9 in place of 14·3.

This may be due to some alteration undergone by the vibrio at 41° which is only partially reversible. It may be that some modification occurs in a strain at 41° resulting in the greater part of its progeny being deprived of toxigenic power and rendered incapable of recovering it at 20°, while some might still retain their toxicity. To prove this would require the titration of a large number of toxins each prepared from a strain derived from a single colony isolated after culture at 41°, and the employment of an impossibly large number of animals.

The authors conclude that the toxigenicity of *V. cholerae* varies inversely with the temperature of incubation between 18° and 41°, and that the titre of the toxin at each of these temperatures remains practically fixed for the Ogawa type even after about a year's storage in the laboratory. On the other hand, passage from 20° to 41° produces a lasting effect since the vibrio subjected to this passage becomes incapable of increasing its toxicity to the level of that of the control vibrio kept constantly at 20°. No loss of toxicity is therefore to be expected in cultures kept at "laboratory temperatures". The increased toxicity of *V. cholerae* demonstrated by growth at a low temperature in artificial media may reflect the hypertoxicity of vibrios isolated from cholera patients in the algid stage of the disease, and can be shown, even at 37°, in vibrios kept for a short time outside the body.

C. C. B. Gilmour

Gallut, J. La séroagglutination dans le diagnostic rétrospectif du choléra. Exposé critique. [**The Retrospective Diagnosis of Cholera by Agglutination. A Critical Review**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 5, 657–63. [15 refs.]

Although agglutinins to *Vibrio cholerae* appear too late in the course of the disease to afford help in diagnosis it would appear at first sight that the

presence of such agglutinins might serve to establish a retrospective diagnosis in individual cases, and might be of assistance in estimating the state of immunity in the population of areas where cholera is endemic. This possibility has engaged the attention of 3 international conferences (IHO, Paris 1911, IHO/WHO, Paris 1949, and WHO, New Delhi 1951 [this *Bulletin*, 1952, v. 49, 949]). The experts at the third of these conferences came to the conclusion that the method was of little practical value in the retrospective diagnosis of isolated cases of cholera, though it might be of assistance in determining the nature of an infection in groups of people who had suffered from diarrhoea and vomiting and were therefore suspected of having contracted cholera.

Gallut points out that two questions have to be considered, namely what titre is to be considered significant and how specific is the reaction. Titres of 1 in 20 to 1 in 50 have been found in healthy persons who have never had cholera and have never received cholera vaccine. Any titre below 1 in 50 must therefore be regarded as insignificant. The titres found in patients and convalescents vary greatly but tend to be low, not exceeding 1 in 120, but Greig [this *Bulletin*, 1915, v. 6, 36] and others record titres varying from 1 in 500 to 1 in 1,000. There seems to be some relationship between the production of agglutinins and recovery from the disease, for Greig observed that only 24 out of 64 fatal cases showed agglutinins, and 180 out of 210 recovered cases were positive. Although the period of excretion of the vibrio by convalescents is short, as a rule, it may occasionally be prolonged for as much as 33 days, and these excreters may show much higher titres than patients. Greig has recorded a titre of 1 in 2,560. The results obtained by different investigators have shown that the titre in vaccinated persons is inconstant. The experts at the Paris conference of 1948 considered that a single injection would produce a titre of 1 in 50 at the most and that after 2 injections it would not exceed 1 in 500. This might make a retrospective diagnosis of cholera in a vaccinated person possible.

Complete reliance, however, cannot be placed on the agglutination of *V. cholerae* by the patient's serum, because the reaction is not absolutely specific. Vibrios contain both O and H antigens of which only the former are considered specific and by means of them *V. cholerae* has been placed in sub-group O1 of Gardner and Venkatraman [this *Bulletin*, 1935, v. 32, 769]. The identification of an unknown vibrio as *V. cholerae* is made by agglutination with a serum containing only O agglutinins. The serum of a person harbouring a vibrio, whether choleraic or not, will contain antibodies corresponding to the O and H antigens of that vibrio, and if those are present in the suspension of *V. cholerae* used in the test, agglutination, which may be non-specific, will result. This is the probable explanation of the titres found by Greig in 7 out of 35 patients from whom cholera vibrios could not be isolated. None of these 35 patients died. O antigens themselves can also cause false reactions. Wong and Chow (*Chinese Med. J.*, 1937, v. 52, 591) found that the sera of persons, vaccinated against cholera with a titre of 1 in 160, also agglutinated *Brucella abortus* up to 1 in 40. This was confirmed by Eisele and others [*Bull. Hyg.*, 1948, v. 23, 179, 591] and hence Huddleson in *Brucellosis in Man and Animals* (1943, London: The Commonwealth Fund) advised caution in making a diagnosis of brucellosis by agglutination tests; in localities where cholera is endemic Gallut has found that anticholera O sera prepared from the rabbit can agglutinate *Brucella* to a titre equal to that against *V. cholerae*, even as high as 1 in 2,000, and the converse of this holds good though to a lesser degree. He has shown that the common factor is the C antigen of *V. cholerae*, Inaba (AC).

This cross-agglutination can take place with human sera, as is proved by

the case of one of his colleagues who had never had cholera, or been inoculated with anticholera vaccine, but was unfortunate enough to contract brucellosis in the laboratory. During his illness, on 20th October, 1953, this patient's agglutination titres were: *Br. abortus suis* 1 in 1,666; *Br. melitensis* 1 in 2,000; *V. cholerae* Inaba 1 in 1,000; *V. cholerae* Ogawa 1 in 100 (partial). After recovery, on 6th January, 1954, the titres were: *Br. abortus suis* 1 in 80; *Br. melitensis* 1 in 80; *V. cholerae* Inaba 1 in 80; *V. cholerae* Ogawa 0. Thus after 3 months the agglutination titre to *V. cholerae* was significant, and, had an Inaba suspension only been used, a retrospective diagnosis of cholera might well have been made. It is evident that in the serological diagnosis of cholera an Ogawa strain only should be used.

Similar cross-reactions have been observed by Felsenfeld [this *Bulletin*, 1949, v. 46, 359] between the Inaba type isolated in Egypt in 1947 and salmonellae containing the antigens I. *XII* . . . g and more recently by Felsenfeld and his colleagues [*ibid.*, 1951, v. 48, 987] in America with *Bact. coli*, *Bact. areogenes*, paracolon organisms, *Proteus*, *Pseudomonas*, and *Bact. alcaligenes*. The common factor here appears to be the specific factor A of *V. cholerae* and part of the non-specific H antigen. The reluctance of the expert committee to recommend such an unreliable reaction can be easily understood.

Gallut concludes that great caution must be exercised in establishing a retrospective diagnosis of cholera by serum agglutination in a patient whose serological history is unknown, and that the only place for the reaction is in the control of anti-cholera vaccination, where it may furnish valuable information if limited to a comparison of titre before and after vaccination, and if it is admitted that the formation of agglutinins runs parallel with the formation of protective antibodies. The hopes entertained of the usefulness of this reaction have proved to be illusory. *C. C. B. Gilmour*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Kean, B. H. & Smillie, W. G. **Intestinal Protozoa of American Travelers returning from Europe.** *New England J. of Med.* 1954, Sept. 16, v. 251, No. 12, 471–5. [15 refs.]

After the last war it was feared that amoebiasis and other intestinal infections might be introduced to the United States by troops returning from abroad, but it is now obvious that there has not been any major increase in such infections among the civilian population.

An opportunity to study this problem was provided by the great increase in the number of American tourists visiting Europe, whose numbers since the last war amounted to about 1,500,000. Many of these travellers experienced diarrhoeas during their sojourn abroad, which might have been due to amoebic infection. This possibility was investigated in the case of students visiting Europe in 1953, from whom faecal specimens were collected and bottled in "MIF" preservative stain [see this *Bulletin*,

1952, v. 49, 727; 1954, v. 51, 311] during the transatlantic crossings there and back. The total number of stool samples thus obtained was 804, including "paired" specimens (*i.e.*, obtained from the same person on the outward and return journeys) from 222 students.

The examination of the stools and the replies to a questionary revealed the following facts: (1) there was no appreciable difference in the incidence of *Entamoeba histolytica* and other protozoal infections before and after visiting Europe, only 6 students having presumably acquired amoebic and giardial infections abroad; (2) from the figures obtained it is reckoned that about 8 per cent. of American students harbour *E. histolytica*; (3) diarrhoea acquired by more than half of the American tourists in Europe is thought to be due not to dysentery bacilli or amoebiasis but to food poisoning; and finally (4) "no evidence was obtained that travelers to Europe acquire sufficient protozoan disease to present a public-health hazard on their return" to the U.S.A. *C. A. Hoare*

Neghme, A. & Silva, R. **Data on the Epidemiology and the Prophylaxis of Amebiasis in Chile.** *Riv. di Parassit.* Rome. 1954, Oct., v. 15, No. 4, 557–76, 4 graphs. [39 refs.]

Exact knowledge of the incidence of amoebiasis in Chile has hitherto been lacking, and the local medical practitioners have been inclined to underestimate the importance of the condition. The authors have examined stools of some 15,000 persons from all parts of the country, using up-to-date methods. The highest incidence of *Entamoeba histolytica* infection was in Arica, which is subtropical; throughout the Central Zone of the country it was 23·85 per cent., and in the South Zone 11·49 per cent. The standards of living and of hygiene in the rural areas are low, and water pollution is almost universal. Other protozoal and helminthic intestinal infections accordingly are also prevalent. [This is a full account in English of work described by the senior author and abstracted in this *Bulletin*, 1955, v. 52, 449.] *A. R. D. Adams*

Urabe, A., Kawamoto, S., Yoshida, Y., Kawahira, Y. & Masaki, Hinako. [**Studies on the Intestinal Helminths and Protozoa in Kagawa Prefecture. Report III. On the Incidence of** *Entamoeba histolytica* **and other Intestinal Protozoa**] *Shikoku Acta Med.* 1955, Jan., v. 6, No. 1, 14–19, 1 chart. [15 refs.] [In Japanese.]

The English summary appended to the paper is as follows:—

"An epidemiological survey of Entamoeba histolytica and other intestinal protozoa in a rural village in Kagawa Prefecture, Saita-mura, Mitoyo-gun was carried out in October 1952, January 1954 and May 1954.

"The results are following:

"1. After one smear-examination the incidence of E. histolytica was 2·5%: E. coli, 4·4%: Endolimax nana, 10·0% and Giardia intestinalis, 2·5% respectively.

"2. Triple infection of E. histolytica, E. coli and Endolimax nana was found one case, and double infections of E. histolytica plus Endolimax nana, and that of E. coli plus E. nana 4 cases respectively.

"3. Incidence rates of female (19·8%) was slightly higher than that of male (17·5%). And intestinal amebic infections occurred least in the 0 to 9 year age group, and they were 14·6 to 21·4 per cent. in other age groups.

"4. Out of 9 cases of Entamoeba histolytica infection 2 showed certain symptoms which seem to be caused by this parasite."

Hara, K., Oka, S., Sawada, T. & Fuse, M. **Cyto-Chemical Observation on *Entamoeba histolytica*. (1) On the Research into Enzymes and Fatty Substances in *Entamoeba histolytica*. (2) On the Research into Carbohydrates in *Entamoeba histolytica*.** *Gunma J. Med. Sci.* Maebashi. 1954, Dec., v. 3, No. 4, 249–67, 10 coloured figs. on pl. [38 refs.]

The authors have carried out an extended investigation on certain components of *E. histolytica* by cytochemical methods. Standard techniques were followed and described. The amoebae were grown in culture or studied in sections of tissue from liver abscesses. [In the former bacteria must, of course, have been included and the results thereby affected to some extent.] The presence and localization of enzymes, fatty substances and carbohydrates in *E. histolytica* are indicated in separate tables which are very convenient for reference.

Briefly these results may be summarized by stating that peroxidase was detected in the ectoplasm and endoplasm. Alkaline phosphatase was present in nucleus and endoplasm but not in ectoplasm. The nucleus contained a large amount of substance staining characteristically for fat, along with some cholesterol ester, and likewise the endoplasm contained these substances in addition to some phospholipid. Cholesterol ester was present in the ectoplasm. Reports on the carbohydrate compounds such as glycogen, mucus, mucoprotein and other polysaccharides present in *E. histolytica* have recently appeared in the literature. The periodic-Schiff reagent has been widely used in the detection of carbohydrates and depends on the reaction between leucofuchsin and aldehydes. In the test for glycogen predigestion of the preparation with saliva was carried out and the staining results obtained were compared with those of untreated controls. It appeared that the nucleus contained only a small amount of glycogen but a large amount of other polysaccharides. Smaller amounts of glycogen were present in the endoplasm.

The detection of acid mucopolysaccharides was based on the affinity of this substance for colloidal iron which is then coloured by the Prussian blue reaction. Gentian violet shows similar affinities for mucopolysaccharides. Some of the components of these mucopolysaccharides are hyaluronic acid along with chondroitin and mucoitin sulphuric acid. The presence of acid mucopolysaccharides was demonstrated in all the amoebic structures. Predigestion with hyaluronidase did not influence the result, and this fact suggests that hyaluronic acid was absent or present only in small amount.

J. D. Fulton

Hallman, Frances A., Michaelson, J. B., Blumenthal, H. & DeLamater, J. N. **Cytochemical Studies on *Endamoeba histolytica*, with particular reference to Polysaccharides.** *Exper. Parasit.* New York. 1955, Jan., v. 4, No. 1, 45–53. [12 refs.]

Rees *et al.* [this *Bulletin*, 1954, v. 51, 583] reported that on staining *E. histolytica* from cultures containing carbohydrates by the Bauer method, a glycogen mass was present. Observations on the polysaccharides present in *E. histolytica* have now been further investigated, by means of a variety of histochemical stains. The results of staining after exposure to certain enzymes are also described. Amoebae in culture with a mixed bacterial flora were grown in the presence or absence of starch and tissue forms obtained experimentally [*ibid.*, 1951, v. 48, 1113] were also used. After preparation of a film from culture sediment the appropriate fixative for the stain

employed was used. The literature on the use of a number of stains for detection of " glycogen ", " glycogen and mucin ", " polysaccharide " and " acid polysaccharide " is quoted. The enzymes, used in aqueous buffer solutions were α- and β-amylase, β-glucuronidase, hyaluronidase and saliva (α-amylase) and the period for which they were allowed to act is given. The authors came to the conclusion that the polysaccharides present cannot be determined by staining alone and the results obtained on using enzymes must be interpreted with caution. The following is the authors' summary:

" Cytochemical staining reactions indicate that cultured amebae and amebae from tissue contain polysaccharides.

" The effect of prior exposure to beta-glucuronidase and to saliva on the staining reaction of amebae from cultures containing starch suggests that more than one type of polysaccharide may exist in these cells. The lack of activity of these enzymatic substances on the staining reaction of amebae from starch-free cultures and from tissues would indicate that the polysaccharide content of amebae varies under different conditions of nutrition.

" When stained by Toluidine blue O, metachromasia is slight or absent in amebae from starch cultures and in those from liver tissue, but is marked in amebae from starch-free cultures." *J. D. Fulton*

Dodin, A. Contribution à l'étude des besoins nutritifs et des conditions de culture d' " Entamoeba dysenteriae ". [**Nutritional Requirements and Cultivation of** *Entamoeba histolytica*] *Méd. Trop.* Marseilles. 1954, Mar.–Apr., v. 14, No. 2, 147–64, 1 fig. [34 refs.]

After a brief historical review of the methods used for the cultivation of *Entamoeba histolytica*, the author describes the results obtained with a number of new media devised by him. For routine purposes Deschien's modification of Dobell's diphasic medium, consisting of a coagulated horse-serum slope covered with Ringer-horse-serum (HShs), proved to be the most useful. Among the new media, good results were obtained with the same solid phase covered with 5 cc. of hydatid fluid of pigs or with 1 cc. of amniotic fluid of cows, diluted with 5 cc. saline, in which the amoebae grew well for 48 hours. Since the chemical composition of bovine amniotic fluid is variable, the author sought to replace it by a solution of a more stable composition, such as a hydrolysate of gelatin, which was prepared by melting 15 gm. of gelatin in 1 litre of water, and adding to it 10 cc. of $2NH_2SO_4$, after which the solution was autoclaved, neutralized with barium oxide, and filtered. The medium consisted of a coagulated horse-serum slope (5 cc.) covered with 0·7 cc. of gelatin hydrolysate diluted in 4·3 cc. of saline. Maximum growth of amoebae in this medium was attained on the 3rd day.

Attempts were then made to grow *E. histolytica* in the fluid components of the above diphasic media. The lower part of the test-tubes used for this purpose were cut at an angle corresponding to the serum slope. No growth was obtained in the Ringer serum or gelatin solutions, while of the 5 samples of amniotic fluids used the amoebae could be cultivated only in three. It was inferred that the essential growth factors were provided by the serum slope. To test this supposition, the negative amniotic fluids and the hydrolysate of gelatin solution were mixed with aqueous extracts of the coagulated horse serum. This admixture resulted in all cases in successful cultivation of the amoebae. All attempts to identify the nature of the growth factors in the extract failed, but it was shown that it could be substituted by indole.

Cultures in the fluid media were used to determine the effect upon the growth of *E. histolytica* of various vitamins, physical and biological factors.

It was found that vitamins B1 and B2, as well as thiamine and choline, promoted growth, whereas it was inhibited by vitamins B6, C and especially K. Observations on the effect of oxygen showed that while anaerobic conditions were harmful to the culture immediately after inoculation of the amoebae, they promoted longer growth when introduced—by covering the medium with liquid paraffin—48 hours later. The same effect was produced by addition of CO_2. The essential rôle of starch in the nutrition of the amoebae and that of bacterial associates in their growth in cultures was confirmed. The author has successfully grown *E. histolytica* with *Proteus mirabilis*. *C. A. Hoare*

Seneca, H. & Bergendahl, Ellen. **Carbomycin, a Growth-Maintaining Factor for *Endameba histolytica* Cultures.** *Science*. 1954, Dec. 10, v. 120, 988–9.

Previous studies [this *Bulletin*, 1953, v. 50, 651] had shown that Magnamycin (carbomycin) had amoebicidal properties *in vitro* against *E. histolytica* and was also active in human infections with this organism. Cultures of the parasite have now been maintained in presence of sub-inhibitory concentrations of the antibiotic during once-weekly and thrice-weekly passage. The medium used was the NIH modification of Boeck and Drbohlav egg medium in which carbomycin was present in concentration ranging from 25 to 200 μgm./ml. Growth in the cultures passaged every 48 hours persisted over 138 transfers and for 40 passages in the weekly transfers. Only at the lowest concentration of antibiotic in both types of culture was the growth as good as in controls and the concentration in the weekly cultures was further reduced to one-half and one-quarter the former lowest dose. The bacterial flora remained unaltered and on transfer of amoebae with bacteria to normal medium, growth occurred as in control cultures with no indication of the need for carbomycin comparable to that described for other organisms which have been grown in the presence of antibiotics. The reason for the final statement of the authors—"Probably in very small quantities carbomycin appears to act as a growth-promoting or vitaminlike factor to *E. histolytica* cultures, or in subinhibitory concentrations, it inhibits or neutralizes some enzyme system or systems that induce autolysis of amebas"—is not understood by the abstracter.

J. D. Fulton

Lipparoni, E. Sindromi allergiche della amebiasi. [**Allergic Manifestations of Amoebiasis**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1954, May, v. 35, No. 5, 223–31. English summary (6 lines).

From Somaliland, Lipparoni describes 2 cases of allergy cured by amoebicidal treatment and therefore assumed to have been due to amoebiasis. The men were aged 42 and 45 years respectively, both being European.

The first patient sought medical advice for general pruritus which was worse after meals and at night; there were no other signs or symptoms apart from some enlargement of the liver; neither cholagogues nor antihistamine drugs proved of any benefit. There was no history of dysentery, but *Entamoeba histolytica* was eventually demonstrated in the faeces and the pruritus disappeared after treatment with emetine and with Aralis, the latter being a combination of chloroquine and bismuth glycollylarsanilate.

The other patient had a history of malaria, furunculosis and amoebic dysentery which was believed cured. After eating tinned anchovies, this

man developed general erythema with many weals, oedema of lips, eyelids and hands, general pruritus which was worse at night and some moderate pyrexia. Stool examinations for *E. histolytica* proved negative at first and the patient derived no benefit from remedies which were directed against the allergy itself. *E. histolytica* was eventually found in the stool after a saline and this man was cured and has remained well after a course of Aralis tablets given 6 daily for 7 days. *J. Cauchi*

Abdel Ghaffar, Y. & Abdel Ghaffar, M. **Atabrine in Hepatic Amebiasis.** *Amer. J. Trop. Med. & Hyg.* 1955, Jan., v. 4, No. 1, 9–12.

Three patients with amoebic liver abscesses and one with an acute amoebic hepatitis were treated with mepacrine orally. The first patient had a large neglected abscess; he was given 0·3 gm. of the drug daily for 10 days and the abscess was aspirated on 3 occasions during this period. He was discharged as cured but returned with a recurrence involving the right chest within two months. The second patient had a similar liver condition; he was apparently moribund on admission and was given 0·6 gm. of mepacrine daily for 15 days, during which foul-smelling pus and gas were drained by open operation. This patient made an uneventful recovery but 6 weeks later he developed a sinus in the right chest which discharged a yellow fluid, free from amoebae. This closed after repeated instillation of 1 per cent. mepacrine solution. The third patient had acute amoebic hepatitis with a raised right diaphragm; this rapidly resolved on treatment with 0·9 gm. of mepacrine daily for 7 days. The fourth was gravely ill with a large amoebic liver abscess, massive oedema and severe anaemia. He was given 0·9 gm. of mepacrine daily for 10 days and the abscess was aspirated after the injection of streptokinase and streptodornase; subsequently 10 cc. of a 1 per cent. solution of mepacrine was introduced into the abscess cavity. He made an excellent recovery.

A strain of *Entamoeba histolytica* in culture was then exposed to mepacrine. It seemed to be 10 times as lethal as chloroquine, but only 40 per cent. as lethal as emetine to the parasites *in vitro*.

Thus, two of the patients with large liver abscesses were not cured of these by the drug; but one failure probably was due to inadequate dosage, and the other to secondary infection. In the other two patients the lesions were sterilized by the mepacrine treatment. The authors conclude that mepacrine is more effective than is chloroquine for the treatment of hepatic amoebiasis. *A. R. D. Adams*

Neal, R. A. **The Influence of Encystation upon the Virulence of *Entamoeba histolytica* to Rats.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, Nov., v. 48, No. 6, 533–6.

Some workers have maintained that the infectivity and virulence of *Entamoeba histolytica* diminish after prolonged cultivation in the trophic stage but remain unaltered or can be restored if the amoebae are allowed to encyst. With the view to verifying these observations, the present author has carried out a series of experiments, using cultures of 6 strains, of which only one (*RD*) produced appreciable ulceration (*i.e.*, was invasive) in the caecum of rats. All the strains were maintained by the cyclical method, *i.e.*, after growing for 2–4 weeks in the trophic stage they were allowed to encyst, after which they were kept for 2–3 months in the refrigerator (4°C.) and then induced to hatch, thus repeating the cycle.

A comparison was made of the infectivity and invasiveness of these strains for rats, by intracaecal inoculation and subsequent examination after 7 days of the caecum and colon for the degree of ulceration and presence of amoebic infection. In the case of one strain (*EA*) 2 parallel lines were maintained for 21 months: one cultivated continuously in the trophic stage, the other by cyclical encystation. At the end of this period no difference was observed between the infectivity and invasiveness of both lines. The same results were obtained with 2 similar lines of strain *ST* [see this *Bulletin*, 1951, v. 48, 640]. Two other strains (*AI*, *ZM*) were examined, first, after going through 2 and 1, and later, after 4 and 2 cycles of encystment respectively. They, likewise, showed no increase of invasiveness. Finally, strain *RD* which has been invasive, gradually became non-invasive in spite of passing through 17 encystment cycles, though its infectivity for rats remained as high as before.

"From these results it is concluded that invasiveness [of *E. histolytica*] is independent of encystation." *C. A. Hoare*

Yoeli, M. **A Report on Intestinal Disorders accompanied by Large Numbers of** *Dientamoeba fragilis*. *J. Trop. Med. & Hyg.* 1955, Feb., v. 58, No. 2, 38–41.

That the common commensal intestinal protozoa may become actively pathogenic has already been shown in the case of *Iodamoeba bütschlii* [this *Bulletin*, 1949, v. 46, 41]. The author records details of 9 patients, in the Jerusalem area, who suffered diarrhoea and other intestinal troubles, in all of whom heavy intestinal infections with *Dientamoeba fragilis* were found. In none of them were *Entamoeba histolytica*, *Shigella dysenteriae*, or other pathogenic infections found on specific search. Treatment with 2 gm. daily of oxytetracycline (Terramycin) by mouth for a week, together with a high protein diet and liberal vitamin intake, caused the disappearance of the symptoms and of the *D. fragilis* infection in every case. It is probable that the drug acted not on the protozoa but on the associated intestinal flora. *A. R. D. Adams*

Rendtorff, R. C. & Holt, C. J. **The Experimental Transmission of Human Intestinal Protozoan Parasites. III. Attempts to transmit** *Endamoeba coli* **and** *Giardia lamblia* **Cysts by Flies.** *Amer. J. Hyg.* 1954, Nov., v. 60, No. 3, 320–26.

In view of the established rôle of the house-fly (*Musca domestica*) in the transmission of *Entamoeba histolytica*, experiments were carried out to determine the possibility of transmission of *Entamoeba coli* and *Giardia intestinalis* by these insects. For this purpose laboratory-bred flies were allowed to feed on faecal suspensions containing the cysts of these parasites, after which they were released into a room, which served as a combined kitchen and dining-room for volunteer prisoners. Before the experiments, the presence of cysts was established by dissection of samples of fed flies, while the men were examined parasitologically and were kept under controlled conditions. In one experiment 18 men were exposed to a total of 127 flies over a period of 8 days, without anyone acquiring an infection. In another experiment flies fed on both *E. coli* and *Giardia* cysts were allowed to contaminate the food of 16 volunteers, of which one became infected with the amoeba but none with the flagellate. It is concluded that the house-fly, though capable of transmitting *E. coli*, is not an efficient vector of either this amoeba or *Giardia*. *C. A. Hoare*

Rendtorff, R. C. & Holt, C. J. **The Experimental Transmission of Human Intestinal Protozoan Parasites. IV. Attempts to transmit *Endamoeba coli* and *Giardia lamblia* Cysts by Water.** *Amer. J. Hyg.* 1954, Nov., v. 60, No. 3, 327–38, 2 figs.

The experiments described in this paper were designed to determine whether the cysts of *Entamoeba coli* and *Giardia intestinalis* could be transmitted through drinking water, and to study the viability of the cysts in water, with the object of throwing light on epidemiological rôle of water-borne transmission. The methods used were the same as those described previously [this *Bulletin*, 1954, v. 51, 1162, 1163]. In one experiment, cysts of the above protozoa were placed in a drinking fountain, from which water was poured out into a bottle used by volunteers for drinking. Out of 20 men using this water 4 (20 per cent.) became infected with *E. coli* but none with *Giardia*. In another experiment the viability of the cysts was tested by adding 100 cysts of each of these protozoa to aerated tap water stored at 8°C. which was consumed by volunteers in the course of 16 days. Infections were produced by *E. coli* and *Giardia* in 70·6 and 64·7 per cent. of the men respectively, during the period of observation.

In the course of these experiments various observations were made on the host-parasite relations in the intestinal infections. Thus, the incubation period for *E. coli* was found to be from 4 to 14 days (average 8·3), that for *Giardia* was from 9 to 22 days (average 13·1). The *Giardia* infections showed a marked tendency to spontaneous recovery. There was only one instance in which very mild gastro-intestinal symptoms were observed, and two instances in which the stools became looser and more frequent: in these 3 cases the men harboured both parasites.

It is concluded that drinking water is a highly efficient method of transmission for cysts of *E. coli* and *Giardia*. *C. A. Hoare*

Meerovitch, E. **A Preliminary Note on the Experimental Infection of Chick Embryos with *Entamoeba invadens*.** *Canadian J. Microbiol.* Ottawa. 1955, Feb., v. 1, No. 4, 284–7, 1 fig.

"Developing chicken embryos were infected intravenously with bacteria-free *Entamoeba invadens*. The parasites invaded the livers of the embryos, and caused the production of typical amoebic abscesses."

Lamy, L. & Mossion, X. Présence de *Giardia* chez le hamster doré. [**Presence of *Giardia* in the Golden Hamster**]

Routh, C. F., McCroan, J. E., Jr. & Hames, C. G. **Three Cases of Human Infection with *Isospora* in Georgia.** *Amer. J. Trop. Med. & Hyg.* 1955, Jan., v. 4, No. 1, 1–8. [20 refs.]

Twenty-seven cases of human infestation with species of *Isospora* have hitherto been recorded in the United States; the present authors add another 3 to this total. Most of these persons appear to have acquired their infections overseas; some of the remainder probably acquired their infections in turn from them. The 3 patients now recorded all resided in Georgia; one was considered to be suffering from an *I. belli* infection, and two from *I. hominis* infections. These particular infections appeared to be

of local origin, and not to be derived from persons returned from overseas; two of them were found in association with a similar infection in the family dog, which possibly was their origin. *A. R. D. Adams*

RELAPSING FEVER AND OTHER SPIROCHAETOSES

Falcone, G. Il cloroamfenicolo nella terapia delle complicazioni oculari della febbre ricorrente da zecca. [**Chloramphenicol in the Treatment of the Eye Complications of Tick Relapsing Fever**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1954, May, v. 35, No. 5, 232–42. [26 refs.] English summary (6 lines).

Falcone gives an account of 4 cases of *S. duttoni* infection with eye complications—iridocyclitis in 2 and optic neuritis and uveitis in the others. Such lesions usually develop late in the disease, sometimes arising after a period of latency, and they are taken to indicate spread of the infection into the cerebrospinal system where the parasite cannot be reached by arsenobenzene. Chloramphenicol can cross the barrier between blood and cerebrospinal fluid in sufficient concentration to attack the parasite, and these 4 patients were successfully treated with a laevorotatory form of the antibiotic (Carlo Erba's Chemicetina). This is more effective and less toxic than optically inactive forms of this antibiotic and the author has previously reported a series of cases which he had had to treat with a racemic form of the drug, other forms not being then available to him. *J. Cauchi*

Colas-Belcour, J. & Vervent, G. Sur des infections mixtes de la souris à spirochètes récurrents et *Plasmodium berghei*. [**Mixed Infections in Mice of the Spirochaetes of Relapsing Fever and** *Plasmodium berghei*] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 4, 493–7.

Four years ago the authors did some preliminary experiments to see if infections of relapsing fever ran a course different from normal in animals previously immunized against *Plasmodium berghei*, and found that the animals were just as susceptible to the spirochaete. They have now reversed the procedure, and have tested mice recovered from various types of relapsing fever. *Spirochaeta microti*, *S. merionesi* and three strains of *S. duttoni* were used. The mice were kept for various intervals (from 8 to 129 days after disappearance of spirochaetes from the blood; usually 2 or 3 weeks) and then received intraperitoneal injections of blood containing *P. berghei*. The average time of survival of mice infected with this strain is 12 days; in these immunized mice, the onset of parasitaemia was not delayed and death sometimes occurred even earlier than usual. There was thus no evidence of cross-immunity, and in 3 instances the malaria lit up the spirochaetal infection, with some regression of the former. [See also this *Bulletin*, 1955, v. 52, 49.] *P. C. C. Garnham*

YAWS AND OTHER TREPONEMATOSES

Laird, S. M. **Yaws in Manchester.** *Brit. J. Venereal Dis.* 1955, Mar., v. 31, No. 1, 30–32.

With increased travel and immigration from tropical countries into Britain diseases acquired in the tropics acquire an increased importance in their differential diagnosis in Britain. This is illustrated by the author in assessing the interpretation of positive Wassermann reactions and Kahn tests found in Manchester in young adult immigrants from the tropics, chiefly male West Africans and West Indians. Of the 48 clinical records consulted, in about half the probable diagnosis was former yaws rather than latent syphilis. A case is recorded of yaws acquired by an English child in East Africa under the age of 1 year and incorrectly diagnosed at the age of 7 years as syphilis. *Frederick J. Wright*

de Beaux, J. **Yaws in the Western Solomon Islands.** *J. Trop. Med. & Hyg.* 1955, Feb. & Mar., v. 58, Nos. 2 & 3, 33–8; 63–8, 2 maps. [10 refs.]

The author records the results of a yaws survey in the Western Solomon Islands and of a pilot treatment campaign on one island. The climatic and living conditions favour the spread of yaws and it was estimated that the incidence of active yaws found was 14 per cent. of the population but questioning of parents would lead to the view that under 1 per cent. escape the disease in childhood and that 90 per cent. are infected under the age of 5 years. Tertiary lesions are most frequent after puberty, consisting chiefly of ulcers and crab yaws but destructive bony lesions were rarely found. After a pilot survey on one island, with a population of 560, treatment with penicillin [PAM] was given to all those showing active yaws and to a few contacts exposed to heavy infection. The adult dose was 1·2 mega units, a second dose being given after an interval of 4 to 5 days. A re-survey after 6 months showed only 9 cases of active yaws but these included 3 of the 4 cases of primary yaws treated which showed one or two superficial ulcers. The question is posed whether the development of some degree of immunity before treatment might be beneficial. These observations conflict with the experimental work of Medina [below]. Further observations on this point are clearly desirable. [The reviewer wonders if the primary yaw was cured and a fresh infection occurred or if the small ulcers seen were traumatic in origin.] It is noted that parents are anxious for their children to pass through the primary stage in the belief that an untreated early lesion protects against crippling late lesions. *Frederick J. Wright*

Medina, R. Reacciones producidas en enfermos de pinta, buba o sífilis por inoculación de *Treponema pertenue*, Castellani 1905.—Su posible aplicación al diagnóstico de curación de estas treponematosis. [**Reactions produced by Inoculation of** *Treponema pertenue* **in Pinta, Yaws and Syphilis and its Application to Test of Cure**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1954, Mar., v. 2, No. 2, 51–87, 22 figs. [28 refs.] English summary.

A record is given of a controlled experiment to determine the results of inoculating with *Treponema pertenue* patients suffering from pinta, yaws or syphilis in its different clinical stages including subjects who had received

some antisyphilitic treatment. The research lasted 4½ years and included the inoculation of 66 healthy controls. Three strains of *Treponema pertenue*, obtained from patients with yaws, were employed. The strains were maintained by passage through human beings. All the controls, when inoculated by the application of 0·2 ml. of lymph (containing 2 to 6 treponemata per field) to a scarified area, developed a primary yaw, the evolution of which is well illustrated by photographs. Treponemata were recovered from all the successful "takes". Correlating the findings with the known history, clinical and serological state of the patients, the author finds that 19 patients with pinta were resistant to inoculation but 4 with pinta who had previously been treated did show unusually slowly-developing lesions. Of 64 patients with yaws, in varying stages, only 4 out of 5 in the initial stage were susceptible.

A group of 86 patients with syphilis, in varying stages from early primary lesions preceding serological changes to late asymptomatic neurological cases, was uniform in resisting inoculation. Patients who had had early syphilis adequately treated were susceptible but those who had complications of chronic syphilis were found not to have been made susceptible by previous chemotherapy. Nevertheless, 3 adults believed to have chronic syphilis on account of persistent positive serological reactions were susceptible to inoculation and, indeed, later happened to acquire primary syphilis again. Two adults who had attained negative serological tests by chemotherapy were insusceptible and later showed evidence of persisting syphilis by the development of aortitis.

It is concluded that inoculation by *T. pertenue* is a help in elucidating obscure cases of yaws, pinta and syphilis and that a positive reaction is a more accurate demonstration of cure of syphilis than can be obtained by tests on the serum. The author justifies the inoculations on the grounds that the yaws which is produced can be rapidly and certainly terminated by a single injection of 600,000 units of PAM (procaine penicillin in oil with 2 per cent. aluminium monostearate).

The author notes that Léon Blanco (*Rev. Med. Trop. y Parasit.*, 1947, v. 3) has shown that syphilitics in all stages can be successfully inoculated with *Treponema carateum*. *Frederick J. Wright*

Hill, K. R. & Gordon, C. C. **Recurrence of Experimental Yaws (Framboesial) Infection in the Hamster.** *West Indian Med. J.* 1954, Dec., v. 3, No. 4, 279–81, 8 figs. on 4 pls.

The authors, in Jamaica, inoculated hamsters intranasally with yaws, either by injecting the upper lip with serum from an active lesion or by rubbing the scarified lip into an open lesion of another animal.

The technique was successful in almost every case. In 3 to 7 weeks a papule developed at the site of infection, and became a papillomatous lesion in a few days: this resembled an early yaws lesion in man. The lesion always contained typical *Trep. pertenue* and the infection was easily passaged; in some cases, auto-inoculation occurred.

Often the lesion spread, sometimes to invade the whole perioral region. All the animals became emaciated and some died, presumably because of difficulty in feeding.

In surviving animals the lesion regressed and healed, though close examination showed scarring with a decrease in hair.

After about 2–10 weeks, exacerbation always occurred at the original site. The appearances were the same as in initial lesions and passage could be

effected, but emaciation was less marked. The secondary lesion, in turn, regressed and again showed an exacerbation; and this cycle of recurrence and remission of lesions at the original site was seen as many as 3 to 4 times in up to 50 animals in 18 months.

Histologically the initial lesion showed the typical framboesial appearance. The epidermis teemed with spirochaetes, especially within the hair follicles. During remission, lesions tended to revert to normal. At the beginning of an exacerbation, a granulomatous inflammation was seen within the cuffs of the tactile hair follicles, but no spirochaetes were demonstrated: later giant cells were seen. At the height of the exacerbation the histological appearances were similar to those of the initial lesion, with many spirochaetes, especially in the hair follicles. The appearances are well shown in 2 photographs and 6 photomicrographs.

It is suggested, from the sequence of events described, that during the remission the spirochaetes lie at the root of the hair follicles within the cuffs of the tactile hair follicles, which latter have a more complicated structure than ordinary hair follicles. These tactile hair follicles (vibrissae) are surrounded at their roots by a collagenous cuff within which are vessels and they are supplied with nerves and muscles.

Relapsing infection sometimes occurs in man. The authors have often seen a framboesial lesion developing at the site of a scar from a previous yaws lesion after injury. In some parts of Jamaica, the incidence of yaws is, paradoxically, higher in immunes than in non-immunes. It is stated that these two aspects of human yaws can be explained by relapses rather than reinfection and it is possible these relapses are a result of spirochaetes lying dormant at the root of the hair follicles, as is suggested in the case of the hamster. *H. J. O'D. Burke-Gaffney*

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Jopling, W. H. **Leprosy in Britain.** *Lancet.* 1955, Apr. 23, 856–7. [Refs. in footnotes.]

In England and Wales leprosy was made notifiable direct to the Ministry of Health in 1951 (in Scotland through the local medical officers of health), but there are no statutory powers whereby a patient can be sent to, or retained in, hospital against his will. Since this regulation was made, 175 cases have been notified, all the infections having been acquired abroad.

The author gives an account of the Jordan Hospital in Surrey, which is administered by University College Hospital, London, and staffed by the Hospital for Tropical Diseases. In this hospital there is accommodation for 18 patients, each having a small flat, and a new block is being built to take 6 others. Only patients with lepromatous disease are admitted. For some years they have been treated with sulphones, but, as judged by regular examination of biopsy specimens and smears, the bacteriological results, in spite of the evident clinical improvement, have been poor. The number of bacilli found have shown significant decrease only after treatment for 4 to 5 years. Many of the patients experience bouts of erythema nodosum leprosum during their long residence in the hospital, and treatment with cortisone or corticotrophin, though symptomatically dramatic, does not end

the attack, which may persist for months. In some patients the brunt of the reaction is borne by the peripheral nerves, and if muscle function is threatened an operation must be undertaken to strip the nerve sheath from the swollen nerve.

Isoniazid and thiacetazone have in general proved disappointing.

The doctor-patient relationship is particularly important in leprosy, and the author writes with understanding of the difficulties experienced in persuading these unfortunate patients to remain in hospital for their own good and for the good of their families. Experience has shown that to treat leprosy patients as out-patients is often unsatisfactory in that many fail to report for examination, and some will not carry out prescribed treatment—in one case with disastrous results. In-patient treatment is desirable, and the staff must deal sympathetically with the patients, who almost inevitably react to the frustrations and disabilities of this long-drawn-out disease by developing psychological states of great difficulty. One means of helping them has been by developing occupational therapy; articles are made, and are sterilized and sold. [The position, *mutatis mutandis*, would seem to be similar to that of tuberculous patients, and the methods adopted at Papworth and Preston Hall could, perhaps, be adapted for this smaller community of leprosy patients.] *Charles Wilcocks*

Montestruc, E. & Berdonneau, R. Deux nouveaux cas de lèpre du nourrisson à la Martinique. [**Two New Cases of Infant Leprosy in Martinique**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 6, 781–3.

Two former instances of leprosy in infants were published by Montestruc [see this *Bulletin*, 1954, v. 51, 803].

The first of the 2 children in the present instance had an achromic macule surrounding the umbilicus at the beginning of its third week. At the time of examination when the child was 17 months old there were similar patches on the face and other parts of the body. Isolated acid-fast bacilli were found in serum taken from the chin. The source of infection had not yet been traced.

The second child was 2 months old when seen. From the 3rd week of life there were numerous macules on the face. Bacteriological examination showed fairly numerous acid-fast bacilli.

The appearance of these very early cases of leprosy is considered as a sign of the tenacity and virulence of the local leprosy endemicity.

Ernest Muir

Montestruc, E., with the collaboration of E. Ragusin, P. Caubet, R. Blache & P. Martin de Mirandol. La lèpre de l'enfant à la Martinique. [**Leprosy in Children in Martinique**] *Internat. J. Leprosy.* New Orleans. 1954, July–Sept., v. 22, No. 3, 288–96. [11 refs.]

Out of 776 leprosy patients diagnosed in Martinique in the last 10 years 238 were under 15 years of age. The author has given up the use of chaulmoogra and now uses DDS alone for treatment. He also hopes to be able to have all new-born children vaccinated with BCG, preferably by injection, as mothers leave hospital before the children have time to get the third dose required when it is given orally. Other methods advocated are: isolation of new-born children of leprous parents, more intensive surveys for finding the disease in schools, removal of children with tuberculoid and indeterminate lesions from school [surely an unnecessary precaution], sending all lepromatous patients to hospital. *Ernest Muir*

Embil, J., Jr., González Prendes, M. A. & Curbelo y Hernández, A. La siembra del *M. leprae* en el saco de la yema del embrion de pollo en desarrollo. [**The Inoculation of** *Myco. leprae* **in developing Chick Embryo Yolk Sac**] *Internat. J. Leprosy.* New Orleans. 1954, July–Sept., v. 22, No. 3, 322–7. English summary (8 lines).

Seven attempts were made to inoculate lepra bacilli into the yolk sac of chick embryos. In none of them was there any increase in the number of acid-fast bacilli. The authors plan to continue their experiments on similar lines using different methods of inoculation of bacilli. *Ernest Muir*

de Souza-Araujo, H. C. Isolamento e estudo experimental de duas novas culturas de bacilos ácido-álcool resistentes de muco nasal de leprosos. [**Isolation and Experimental Study of Two New Cultures of Acid- and Alcohol-Resistant Bacilli from the Nasal Mucosa of Leprous Patients**] *Mem. Inst. Oswaldo Cruz.* 1954, Mar., v. 52, No. 1, 9–14, 2 pls. (1 coloured). English summary.

Two new strains of acid-fast bacilli obtained from the nasal mucosa of 2 leprous girls are described; these are in addition to one previously described in 1951. They were cultured on tubes of Loewenstein medium. Inoculation of one into rats and mice produced small tumours in 55 days. After 3½ months similar cultures were again obtained from the same patient. The strains from both patients were strongly Gram-positive and acid-fast. They grew slowly at first, but more quickly after the first few subcultures.
Ernest Muir

Khanolkar, V. R. **Perspectives in Pathology of Leprosy.** *Indian J. Med. Sci.* 1955, v. 9, Suppl. 1, 44 pp., 27 figs. (22 coloured) on 10 pls. [75 refs.]

This is a series of 4 lectures which the author delivered in various countries, and which it was suggested " deserved publication, as they embodied some unorthodox ideas ". The first gives the history of the pathology of leprosy from the time of Danielssen and Boeck up to the present time. The second deals with lepra reaction and the concentration of bacilli in skin biopsies, with special reference to children born in leprosy homes and in highly endemic areas.

The third lecture deals with the nature and distribution of cutaneous nerves, and the changes which take place in them in the various types of leprosy. The question of nerve trunks as pathways for infection is discussed. The quotation from Payling Wright that " the semi-solid, or at least highly viscous, consistence of the [axonal] protoplasm discourages any belief that foreign material can be carried for long distances in relatively short times by streaming or circulation of the axoplasm " is contested by the author's statement: " We have recently been fortunate in obtaining transverse sections of fine cutaneous nerve twigs with the bacilli lying in situ and cut transversely. A study of these sections leaves no doubt in one's mind that bacilli are located and travel within the axons ". This is illustrated in a few of the 27 illustrations which accompany the lectures.

The last lecture describes the classification of leprosy and the changes which may take place in types. *Ernest Muir*

Ross, Hilary. **The Results of a Modified Middlebrook-Dubos Hemagglutination Test in Leprosy; 261 Cases.** *Internat. J. Leprosy.* New Orleans. 1954, Apr.–June, v. 22, No. 2, 174–80, 1 fig. [12 refs.]

The Middlebrook-Dubos haemagglutination test as modified by Scott and Smith [*Bull. Hyg.*, 1950, v. 25, 900] was performed on 261 leprosy patients divided into 3 groups: active lepromatous with bacilli present (169); clinically quiescent lepromatous in whom bacilli were not found (52); tuberculoid (40). In a control group the highest titre was found to be 1 in 8, which was taken as normal. In the first of the 3 leprosy groups 91·1 per cent. had titres above normal; in the second there were 75 per cent. above normal; and in the third group there were 70 per cent. above normal. However, in the third group the highest titre reached was 1 in 256 compared with 1 in 4,296 in the first group. Of 21 patients under treatment for 1 year there was a decrease in titre in 6, no change in 7, and an increase in 8. *Ernest Muir*

de Souza-Araujo, H. C. & Lagôa, F. R. Sôro-reações em leprosos usando como antígenos extrato de leproma Stefansky e culturas de bacilos ácido-álcool resistentes. [**Sero-Reactions in Leprous Patients with Extract of Leproma of Rat Leprosy and Cultures of Acid- and Alcohol-Resistant Bacilli as Antigens**] *Mem. Inst. Oswaldo Cruz.* 1954, Mar., v. 52, No. 1, 1–7, 4 figs.

The examination of serum of leprous patients showed that it was able to fix complement when mixed with watery suspensions of rat leprosy nodules. This was repeated later on a larger scale in patients suffering from the various types of leprosy and others who had recovered under sulphone treatment. The results obtained showed that the serum of leprous patients contains antibodies capable of fixing complement, in the presence of rat leprosy bacilli, with more intensity than the antigen of Bordet-Ruelens, used in the serological diagnosis of syphilis.

Ernest Muir

Ross, Hilary. **An Evaluation of the Maillard-Gagliardo Complement Fixation Test in Leprosy. A Review of 100 Cases.** *Internat. J. Leprosy.* New Orleans. 1954, July–Sept., v. 22, No. 3, 328–30.

It had been found that the Middlebrook-Dubos haemagglutin test in leprosy gave titres higher than controls in 88·5 per cent. Maillard [*Bull. Hyg.*, 1952, v. 27, 728] claimed that with his modified technique reaction titres were obtained in 23 out of 24 sera from leprous patients. The present trials, using sera from 100 leprous patients, gave only 44 per cent. with titres above normal with the Maillard-Gagliardo complement-fixation test [*ibid.*, 539]. In this test the distinctive feature is that the complement is reconstituted dried, frozen guineapig serum. *Ernest Muir*

Diniz, O. & Neto, H. A. **Results of the Use of Dilute Mitsuda Antigen.** *Internat. J. Leprosy.* New Orleans. 1954, Apr.–June, v. 22, No. 2, 144–6, 12 figs. on 2 pls.

Under sulphone therapy patients with gross lepromatous lesions, from whom material for making Mitsuda test antigen can be obtained, are becoming difficult to find. It is therefore necessary to conserve this antigen

as much as possible. It was found that while a 1 in 20 dilution of antigen gave 78·7 per cent. of positives, a dilution of 1 in 1,000 gave only 49·3 per cent. of positives. The authors suggest using the greater dilution in a first test, followed by a second test with a more concentrated antigen in those found negative the first time. (*Cf.* Floch, *Ann. Inst. Pasteur*, 1952, v. 82, 517.) *Ernest Muir*

Dharmendra, Mukerjee, N. & Khoshoo, P. N. **A Comparative Study of Three Antigens for the Lepromin Test.** *Internat. J. Leprsoy.* New Orleans. 1954, July–Sept., v. 22, No. 3, 311–21.

Three lepromin antigens were tried against each other: Wade's modification of Mitsuda's antigen (filtered through 1 layer of nylon), Dharmendra's antigen, and a modification of the latter with less chloroform extraction and less grinding. All 3 antigens were injected simultaneously in 110 patients, 91 of whom (29 maculo-anaesthetic, 36 tuberculoid, 26 lepromatous) remained for the late reading of results. The immediate flare was considered to be non-specific and of no value. The early reading was taken after 24 hours, and only negative or doubtful readings were repeated at 48 hours. In the lepromatous cases all readings were negative. In maculo-anaesthetic cases 82 and 56 per cent. respectively were positive with the Dharmendra and Wade antigens at the first reading, and 34 and 96 per cent. at the second reading. In the tuberculoid cases they were 95 and 92 per cent. positive respectively for the first reading and 74 and 100 for the late. In general the early reactions with the Dharmendra and late reactions with the Wade antigen were in agreement. Dharmendra's variant antigen gave stronger late reactions than his original, but not nearly as strong as the Wade antigen. *Ernest Muir*

Souza Campos, N. & Rath de Souza, P. **Reactional States in Leprosy. Lepra Reaction; Tuberculoid Reactivation (Tuberculoid Lepra Reaction); Reactional Tuberculoid Leprosy; Borderline (Limitantes) Lesions.** *Internat. J. Leprosy.* New Orleans. 1954, July–Sept., v. 22, No. 3, 259–72, 20 figs. on 5 pls.

The term "lepra reaction" strictly speaking applies only to the reactive state or acute exacerbation of the lepromatous type. There are, however, 3 other reactive states described which are more or less connected with the tuberculoid form of leprosy. The first of these is "tuberculoid reactivation" which occurs in already existing tuberculoid lesions, and never causes general disturbance. It starts slowly and insidiously. Bacteriological examination remains negative, and the lepromin reaction remains positive and unchanged.

"Reactional tuberculoid" leprosy may be primary, but more commonly it is secondary to the indeterminate or even tuberculoid form. It comes on abruptly in susceptible persons with unstable resistance. It may be followed by the disappearance and the cure of leprosy. On the other hand it may pass on into the "border-line" form. The lesions are at first bacteriologically positive, but the bacilli become less as the condition subsides. The lepromin reaction diminishes at the time when the bacilli are many, but tends to become stronger as the bacilli become fewer.

The "border-line" form is so called because it has characteristics of both the lepromatous and the reactional tuberculoid forms. The inner edge of a lesion may be well-defined where it surrounds a former reactional

tuberculoid lesion; but its outer margin is ill-defined. Lesions are more markedly and more persistently bacteriologically positive than those of the reactional tuberculoid. Histological examination shows signs characteristic of both lepromatous and tuberculoid pictures. The article is well illustrated with plates showing clinical and microscopic appearances. *Ernest Muir*

Floch, H. La réaction de Mitsuda rendue positive par une primo-infection tuberculeuse est-elle accompagnée d'une immunité relative antilépreuse? [**Is the Rendering Positive of the Mitsuda Test by a Primary Tuberculous Infection accompanied by a Relative Anti-Leprosy Immunity?**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 6, 771–5.

It has been noticed that in French Guiana the form of leprosy among the Europeans is more of the severe lepromatous type than among the indigenous Creoles. Comparing Creole with European prisoners, who came to French Guiana in adult life, it was found that among the lepromin-positive patients of the Creole group 73 were tuberculin positive as compared with 100 per cent. in the European group, whereas among the lepromin negative (chiefly lepromatous) patients the Creoles showed 40 per cent. tuberculin positive as compared with only 33 tuberculin positive among the Europeans. This is accounted for by the fact that the Creoles had acquired some slight resistance to leprosy by contact with it during their earlier years, while among the Europeans such contact had not been possible. From this it is argued in reverse that a negative tuberculin reaction augurs worse for a European than for a Creole as he is more likely to acquire the negative lepromin (chiefly severe lepromatous) form of leprosy. It is further argued that a previous mild infection with tuberculosis gives para-immunity to leprosy, and that BCG vaccination gives a certain amount of resistance to leprosy.

Ernest Muir

Convit, J. & Rassi, E. **Lepromin and Tuberculin Tests in Venezuelan Leprosy Foci, Induction of Lepromin Reactivity by BCG Vaccination.** *Internat. J. Leprosy.* New Orleans. 1954, July–Sept., v. 22, No. 3, 303–10, 2 figs.

Out of 8,385 persons tested with lepromin, 7,029 (83·8 per cent.) were found to be positive. Of the 1,356 with negative lepromin tests, 960 were vaccinated with 0·2 mgm. of BCG intradermally and 92·2 per cent. became lepromin positive. It is estimated that if all those with negative lepromin reactions had been vaccinated and given a second test, only 1·3 per cent. of the community would have remained negative. It is considered therefore that BCG vaccination, which can reduce the percentage of Mitsuda-negatives from 16·2 to 1·3 per cent., will be effective in prophylaxis.

Ernest Muir

Casile, M., Saccharin, H. & Destombes, P. Poly-névrite Hansenienne tuberculoide caséifiée des nerfs tibiaux avec artérite. Étude anatomo-clinique. [**An Anatomical and Clinical Study of Leprous Tuberculoid Polyneuritis of the Tibial Nerves, with Caseation and Arteritis**] *Internat. J. Leprosy.* New Orleans. 1954, Apr.–June, v. 22, No. 2, 123–8, 8 figs. on 2 pls.

A patient had been in hospital 15 times in French Guiana, Martinique and France between 1946 and 1952. As many as 7 different diagnoses of his condition had been made, without leprosy being suspected. At last on his

return to French Guiana he was readmitted to hospital in a poor general state of health, with a perforated ulcer of his left foot. The skin of the lower third of the left leg was atrophic, pigmented and cracked. The lower third of the leg was cold and anaesthetic and the pulse could not be felt. The patient was continually complaining of great pain, which would not yield to vasodilators or analgesics. He could walk only with difficulty.

At last, at his request, the leg was amputated at the junction of the middle and lower thirds. Examination of the amputated part confirmed the diagnosis of leprosy which had been suspected before the operation, though there were no signs of leprosy in any other part of the body. Examination of the skin showed various typical tuberculoid foci, superficial and deep. The posterior tibial nerve was found much thickened (to as much as the Achilles tendon) and irregular, the enlargement extending into the plantar branches. The anterior tibial (deep peroneal) was only slightly thickened, and the common peroneal appeared normal. Histological examination of the posterior tibial showed all degrees of tuberculoid changes with caseation, a few bacilli and the formation of a small abscess; but the anterior tibial showed only the ordinary tuberculoid changes without caseation. There were also considerable thickening and degeneration of the blood vessels accompanying both of these nerves, with organized thrombus in the vessels alongside the posterior tibial. These vascular changes are supposed to have had some effect upon the clinical condition. The article is well illustrated.

Ernest Muir

Choyce, D. P. **Ocular Leprosy, with reference to certain Cases shown.** *Proc. Roy. Soc. Med.* 1955, Feb., v. 48, No. 2, 108–12 (Sect. Ophthalm. 2–6).

This lecture is part of a symposium at which ocular leprosy was discussed and 6 cases of leprosy of the eye were demonstrated.

The results of involvement of the VII and V nerves are described, the former causing myo-atrophy of the superior part of the orbicularis oculi muscle, and the latter causing corneal anaesthesia and sometimes ulceration of the cornea. Various theories of the modes of infection of the eyeball are discussed, the author favouring the opinion that " in view of the known predilection of the leprosy bacillus for peripheral nervous tissue . . . [it is a reasonable] theory that they migrate to these regions along the ciliary nerves ". The pannus of leprosy is distinguished from that of trachoma by the absence of involvement of the tarsal plates, abundant anastomoses between the vessels, and a lesser degree of infiltration of the substantia propria. A statement is made that " secondary glaucoma is frequent and of great danger to the patient, as it is this complication which is, in part, responsible for the high incidence of blindness in ocular leprosy ".

The claim of Elliott [this *Bulletin*, 1951, v. 48, 75] to have diagnosed 6 cases of leprous choroidoretinal lesions is questioned, leprosy being considered as confined to the anterior segment. Provided the disease is in the quiescent phase, ocular leprosy responds surprisingly well to surgical procedures.

Ernest Muir

Kirwan, E. W. O'G. **Ocular Leprosy.** *Proc. Roy. Soc. Med.* 1955, Feb., v. 48, No. 2, 112–17 (Sect. Ophthalm. 6–11), 3 figs.

The author draws upon his unrivalled experience of ocular leprosy to provide probably the best description of the clinical manifestations as they affect the eyes which the reviewer has so far had the good fortune to read.

He gives in considerable detail the manner in which the various parts of the eye may be affected. There are several excellent illustrations. He stresses that early diagnosis and early treatment of eye lesions are of great importance, but adds that in his experience the benefit to the eyes from sulphone therapy is considerable. The lepra reaction is also indicted as a dangerous ocular complication and he discusses the use of cortisone in its control.

With regard to lesions of the posterior segment, the author's touch is perhaps a little less sure. He states, " lesions of the posterior segment . . . do occasionally occur . . . The wonder is that they are not more frequently observed ". The next paragraph, however, contains the statement that " as lesions of the posterior segment of the eye do not occur or at all events occur rarely . . ." The reader is thus left in some doubt as to the author's real beliefs with regard to this controversial point.

Apart from this minor detail this paper is one of the most balanced and best written accounts of ocular leprosy to appear in recent years and should be read by all those with an interest in the subject. *D. P. Choyce*

Gramberg, K. P. C. A. **Ambulatory Treatment of Lepra Patients with Sulphones in Indonesia.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, Mar., v. 7, No. 1, 73–82. [10 refs.]

The value of sulphones in the ambulatory treatment of leprosy in Java is discussed. Though they prove more attractive to patients than has previous treatment, the author finds it an objection that the length of treatment is not known, and that reactions and other complications may discourage patients from attending during the early stages of treatment. This necessitates additional staff to visit patients in their own homes. The chief difficulty is that in an underdeveloped country the cost of leprosy treatment is too great, chiefly because of " this too-expensive drug ". The treatment was usually 1–3 (or even 6) tablets (0·3 gm. each) of Diasone for 6 days a week for 2 months, followed by a rest of 2 weeks. This meant a weekly cost per patient of a half to one U.S. dollar, or about $20 to $40 [£7 to £14 approx.] a year. " D.D.S. was first said to be about twenty times cheaper than diasone, but when at last it was obtainable in Java, it cost about one third of the government price of diasone." [Either excessive doses of DDS must have been used (the now established dosage is 600–800 gm. per week) or there must have been an excessive charge. The former appears to have been the case, as DDS is stated to be more toxic than Diasone, whereas it is generally agreed that this is not the case provided the accepted dosage of DDS is used, and very small, gradually increasing, initial amounts are given. The cost per patient per year should be well within one U.S. dollar.] *Ernest Muir*

Byers, J. L. & Wolcott, Rolla R. *Mycobacterium leprae* **in Skin and Nasal Scrapings during Sulfone Treatment. A Review of 146 Cases.** *Internat. J. Leprosy.* New Orleans. 1954, July–Sept., v. 22, No. 3, 285–7, 2 figs.

It was found that in 146 persons with leprosy, all of whom with the exception of 2 with tuberculoid lesions were suffering from the lepromatous form, the nasal mucosa became negative in 50 per cent. during 1 year of sulphone treatment. But skin scrapings became negative in 1 to 10 years in only 10 per cent. *Ernest Muir*

Palencia, L., Montaño, R. & Varela, G. Estudio bacterioscópico de la linfa de 100 enfermos leprosos tratados con sulfonas. [**Bacteriological Study of the Lymph of 100 Leprous Patients treated with Sulphones**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1954, Sept., v. 14, No. 3, 133–47, 2 graphs. [13 refs.]

One hundred patients (73 lepromatous, 21 tuberculoid and 6 uncharacteristic) formed the basis of this experiment. Serum was obtained from each patient by puncturing a fold of skin rendered ischaemic by pressure. Smears from the sera were stained by the Ziehl-Neelsen technique. The results are shown in 2 graphs. The greatest number of bacteriologically positive cases was found among those treated for 2 to 5 years, and the greatest number of negatives in those treated for 5 to 7 years. The bacteriological examination was still positive in patients treated with sulphones for 6 years. *Ernest Muir*

Guinto, R. S., Doull, J. A., de Guia, L. & Rodriguez, J. N. **Mortality of Persons with Leprosy Prior to Sulfone Therapy, Cordova and Talisay, Cebu, Philippines.** *Internat. J. Leprosy.* New Orleans. 1954, July–Sept., v. 22, No. 3, 273–84. [14 refs.]

Among patients in the communities mentioned with lepromatous leprosy the ratio of actual deaths to those expected at age-specific rates prevailing in the general population was 4 to 1 for patients 15 to 29 years of age, 7·2 to 1·0 for those 30 to 49 years old, 2·5 to 1·0 for those 50 years and over. There was little difference between those with non-lepromatous leprosy and the general population. The figures are based upon accurate statistics covering some 15 years of experience. *Ernest Muir*

Montestruc, E. La cortisone dans le traitement des réactions lépreuses. [**Cortisone in the Treatment of Leprous Reactions**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 6, 848–56, 8 charts.

The author treated 5 patients in whom severe reactions interfered with sulphone or thiosemicarbazone treatment. He began with 200 or 300 mgm. (half by mouth and half by injection) twice on the 1st day, 150 mgm. on the 2nd day, then 100, 75 and 50 mgm. on the following days. Generally the reaction ceases, but if necessary the amount is increased again to 75 or 100 mgm. He finds that with this it is possible to return to sulphone treatment patients who would otherwise be unable to continue it.
Ernest Muir

Hale, J. H., Molesworth, B. D., Russell, D. A. & Lee, L. H. **Isonicotinic Hydrazide in the Treatment of Leprosy.** *Internat. J. Leprosy.* New Orleans. 1954, July–Sept., v. 22, No. 3, 297–302, 8 figs. on 2 pls. [13 refs.]

It was intended to treat 83 patients with isoniazid for a year, but after 8 months the greater improvement noticed by the patients in those under sulphones made it necessary to discontinue the treatment. There was, however, some clinical improvement, especially in the general condition, in 26 of the patients. *Ernest Muir*

Ann. Soc. Belge de Méd. Trop. 1954, Oct. 31, v. 34, No. 5, 565–652, 1 graph. [10 refs.] Evolution des méthodes de prophylaxie de la lèpre [**Evolution of Methods of Prophylaxis of Leprosy**] [Dubois, A., 565–74]; Méthodes d'organisation de la lutte contre la lèpre [**Methods of Organizing the Fight against Leprosy**] [Laviron, P., 575–87]; Une question d'actualité: la maladie de Hansen en A.E.F. [**A Present-Day Question: Hansen's Disease in French Equatorial Africa**] [Richet, P., 589–602]; L'évolution des lépreux dans une léproserie. Rapport sur une partie des lépreux de la léproserie de Tshumbe Sainte-Marie [**The Evolution of Leprosy in a Leprosarium. Report on a Group of Leprous Patients in the Leprosarium of Tshumbi Sainte-Marie**] [Hemerijckx, F., 603–29]; Organisation actuelle de la lutte contre la lèpre au Congo belge et au Ruanda-Urundi [**Present Organization of the Campaign against Leprosy in the Belgian Congo and Ruanda-Urundi**] [Dricot, C., 631–6]; La posologie des sulfones en thérapeutique de masse [**The Posology of Sulphones in Mass Treatment**] [Scohier, L., 637]; L'organisation de la lutte antilépreuse dans la zone C.R.C. au Népoko [**The Organization of the Campaign against Leprosy in the CRC (Congo Red Cross) Zone in Népoko**] [Swerts, L., 639–41]; Discussion [Chesterman, C. C., President, 643–51].

The above papers composed a symposium held in Léopoldville at the inauguration of the Princess Astrid Institute of Tropical Medicine.

Leprosy was one of the last problems to be undertaken in the Belgian Congo, other medical and public health problems being considered to have priority. In 1927 the Red Cross of the Congo instituted a pilot centre in Népoko to enquire into the curability and prophylaxis of leprosy. Repeated surveys carried out up to 1952 estimated a total of cases in the country (with its population of 11,788,711) as 150,814, or 12·79 per thousand. Since treatment with sulphones became available isolation of patients is limited to those who are strongly bacteriologically positive or are suffering from post-therapeutic reactions.

The second paper details the methods in use in French West Africa. These include the outdoor treatment of patients with DDS, chiefly administered by injection of suspensions at weekly or fortnightly intervals, though oral administration of tablets is used for those in hospitals or resident near treatment centres. The development of a general mobile service for hygiene and prophylaxis has made it possible to stop leprosy patients from coming together in great numbers attracted by the hope of treatment, and thus forming ambulant foci of infection. There are at present 1,500 centres or subcentres where 85,000 patients are treated, 20,000 with suspensions of sulphones, 20,000 with DDS orally, 5,000 with DDS and chaulmoogra, and 40,000 with chaulmoogra. In hospitals there are 2,500. It is hoped to develop the prophylactic use of BCG, which so far has only been used in maternity centres and schools, and only for the control of tuberculosis.

Since the end of 1953 a huge anti-leprosy campaign has been developed throughout the whole of French Equatorial Africa. Already more than half the leprosy patients in the 4 territories of the Federation are under treatment. From 1951 to 1954 the number of patients detected has risen from 37,508 to 74,875, and the number under treatment from 2,268 to 42,540. It is calculated that there are about 80,000 in all. The personnel consists of 4 European sanitary assistants and 64 *infirmiers journaliers*. The latter are supplied with bicycles, and 15 automobiles are also used.

The fourth paper describes the evolution of leprosy in a leprosarium in

the Belgian Congo. Out of 100 lepromatous cases on sulphone treatment 13 per cent. have become negative, and 60 per cent. nearly negative, in 4 years. There are 13 larger leprosaria as well as a number of smaller ones in the Belgian Congo. In 3 of the territories the leprosy rate is as high as 107·4, 91·17 and 74·4 per thousand. It is calculated that there are about 210,000 patients with leprosy in the whole country. In Ruanda-Urundi there are about 5,000 patients in a population of 4,144,000 (1·2 per thousand).

The sixth paper deals with the posology of the sulphones. The minimum effective adult doses are: DDS by mouth 150 mgm. twice weekly; injected Sulphetrone 2 cc. of a 50 per cent. solution twice weekly; DDS suspension 2 cc. of a 25 per cent. suspension injected once a week. The maximum subtoxic doses for the adult are: DDS by mouth 300 mgm. twice weekly; injected Sulphetrone 4 cc. twice a week; DDS suspension 4 cc. once a week. The dose advised is somewhere between these limits. The higher doses should only be used in places where strict supervision is possible.

The seventh paper describes briefly the organization of the Red Cross zone at Népoko, consisting of segregation for infectious patients, outside treatment for those not infectious, and a laboratory service. There is also the possibility of adding BCG vaccination to the other services.

In the discussion which followed the papers such subjects as the infectiousness of non-lepromatous cases, the length of treatment after the patient becomes negative, the isolation of children from infectious parents, and BCG vaccination were debated. Dr. Morris spoke on leprosy in Southern Rhodesia where the rate is about 2·5 per 1,000, and Nyasaland where it is about 12 per 1,000. *Ernest Muir*

Chang, Y. T. **Chemotherapy of Murine Leprosy. III. The Effects of Nicotinamide and Pyrazinamide (Aldinamide) on Mouse Leprosy.** *Internat. J. Leprosy.* New Orleans. 1954, July–Sept., v. 22, No. 3, 331–46, 1 text fig. & 20 figs. on 5 pls. [69 refs.]

In two experiments the effects of various drugs in controlling infection with *Myco. leprae-murium* in white mice were tested. In the first experiment 6 groups of 20 mice each were used, 1 group being used as a control, 1 group being given DDS, 2 groups nicotinamide, and 2 groups pyrazinamide. Treatment was started on the day after inoculation with rat leprosy intraperitoneally.

In the second experiment isoniazid and streptomycin were also added. There were three groups on each drug, and 3 control groups: 1 with normal mice, 1 with killed bacilli, and 1 with murine leprosy untreated. The streptomycin was injected subcutaneously and the other drugs were given mixed with the food.

The results showed that nicotinamide and pyrazinamide were highly effective in the suppression of the leprous infection, these two being equally effective with isoniazid and superior to streptomycin; DDS was the least active. When treatment was delayed to 2 months after inoculation, only nicotinamide, pyrazinamide and isoniazid had any significant action.

Ernest Muir

HELMINTHIASIS

In this section abstracts are arranged as far as possible in the following order:—Trematodes (*schistosomes, other flukes*); Cestodes (*Diphyllobothrium, Taenia, Echinococcus, other cestodes*); Nematodes (*Hookworms, Ascaris, Filarial Worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.*).

Rogers, W. P. **Amino Acids and Peptides excreted by Nematode Parasites.** *Exper. Parasit.* New York. 1955, Jan., v. 4, No. 1, 21–8. [18 refs.]

World Health Organization. Technical Report Ser. No. 90. **Bilharzia Snail Vector Identification and Classification (Equatorial and South Africa). Report of a Study-Group.** Paris, 22–27 February 1954. 22 pp. Geneva: 1954, Nov. [1s. 9d.; $0.25; Sw.fr.1.–.]

The present report results from a meeting of the Study-Group in February 1954. The group had been set up as a result of recommendations of the committees on Bilharziasis of the World Health Organization [*WHO Techn. Rep. Ser.*, 1950, No. 17; 1953, No. 65; this *Bulletin*, 1953, v. 50, 1151]. In accordance with the priority given to that region the report deals with molluscan vectors in Africa only (excluding North Africa). The nature of the problems involved in definitive identification and classification of intermediate hosts and related species is outlined [theoretical aspects were recently reviewed by Hubendick, this *Bulletin*, 1955, v. 52, 276].

Definitions are given of terms used in zoological taxonomy [following, in accordance with modern usage, those of Mayr, Linsley and Usinger, *Methods and principles of systematic zoology*, 1953, New York], including Family, Genus, Species and Subspecies. The word Form is to be used as a neutral term for a specimen, or specimens with common features, which may be either genotypical or ecophenotypical.

For some time, confusion has existed in the nomenclature and diagnoses, not only of the species but of the genera and family to which the snail vectors belong. A satisfactory [and presumably final] revision of the classification of the African vectors from the level of family down to that of subgenera is presented in this report. This revision is briefly summarized here, since it does not conform completely with other recent work on the systematics of these snails [*e.g.*, Baker, *The Molluscan family Planorbidae*, 1945, Univ. of Illinois Press, Urbana; Ranson, this *Bulletin*, 1954, v. 51, 948]. The Planorbinae and Bulininae are regarded as subfamilies of a single family Planorbidae [thus revoking Baker's separation of the Bulinidae as a family]. The Planorbidae are defined as aquatic snails, with shells discoidal, globose or turreted; male and female genital openings on left side; a secondary gill (pseudobranch) present; radula with central teeth bearing two cusps. The subfamily Planorbinae has flat, discoidal, or lens-shaped shells; the prostate gland elongate; male copulatory organ with normal penis; pseudobranch not folded. It contains many genera including *Biomphalaria*. The type genus of this subfamily, *Planorbis*, includes only palaeo-arctic species, and that generic name should never be applied to the intermediate hosts of schistosomiasis. The subfamily Bulininae has turreted or globose shells; a lobular pseudobranch; prostate gland fan-shaped; male copulatory organ with "ultrapenis"; and contains one genus *Bulinus* (following Hubendick, *Arkiv Zool.*, 1948, v. 40, 48). [A schematic chart in this report shows only three subfamilies of the Planorbidae—the third being the Plesiophysinae, which is not defined or

mentioned in the text. It is nowhere indicated whether the groups Segmentinae and Planorbulinae are to be regarded as subfamilies of the Planorbidae, or not, although species belonging to these groups do occur in Africa, and may be vectors.]

It is agreed that all the species known as intermediate hosts of *Schistosoma mansoni* are generically the same. These and their related species are assigned to the genus *Biomphalaria* Preston, 1910; and the genera *Australorbis*, *Afroplanorbis* and *Tropicorbis* are considered synonyms. The genus *Biomphalaria* is defined as having a discoidal shell, diameter 8 mm. or more; pseudobranch not lobular; prostate duct absent; male copulatory organ with a normal penis; flagella and stylet absent. [Ranson's diagnostic character of the prostatic diverticula having subdivided extremities in *Biomphalaria* is not utilized.]

All the species known to serve as intermediate hosts for *Schistosoma haematobium* in Africa are considered to belong to the one subfamily Bulininae, and to the single genus *Bulinus*. The Study-Group considers *Pyrgophysa* Crosse and *Isidora* Ehrenbergh to be merely synonyms of *Bulinus*, while *Physopsis* Krauss is a subgenus of *Bulinus*. The genus *Bulinus* is diagnosed by the same characters as its subfamily (above), and two subgenera are characterized as follows. The subgenus *Physopsis* has a ridge present on the ventral side of the kidney; columella usually truncate; nuclear whorls usually not ribbed or striated, but usually with small dots arranged spirally. The subgenus *Bulinus* has no ridge on the ventral side of the kidney; the columella usually continuous, not truncate; and striae usually present on nuclear whorls.

Diagnostic lists are given for 15 species of *Biomphalaria*, and for 4 species of the *Physopsis* division of *Bulinus*. These lists are provisional: the specific descriptions, relationships and distributions quoted may have to be modified when more material becomes available. [However, even in their present incomplete state, these descriptions should be of great value to field workers.]

The species described are as follows:—

Biomphalaria sudanica (von Martens, 1870)
Biomphalaria boissyi (Potiez & Michaud, 1838)
Biomphalaria camerunensis (Boettger, 1941)
Biomphalaria new species
Biomphalaria salinarum (Morelet, 1868)
Biomphalaria ruppellii (Dunker, 1848)
Biomphalaria adowensis (Bourguignat, 1879)
Biomphalaria nairobiensis (Dautzenberg, 1908)
Biomphalaria pfeifferi (Krauss, 1848)
Biomphalaria kivuensis (Schwetz, 1950)
Biomphalaria choanomphala (von Martens, 1879)
Biomphalaria elegans (Mandahl-Barth, 1954)
Biomphalaria stanleyi (Smith, 1888)
Biomphalaria smithi (Preston, 1910)
Biomphalaria germaini (Ranson, 1953)

Bulinus (*Physopsis*) *africanus* (Krauss, 1848)
Bulinus (*Physopsis*) *globosus* (Morelet, 1866)
Bulinus (*Physopsis*) *nasutus* (von Martens, 1879)
Bulinus (*Physopsis*) *abyssinicus* ([von Martens] Jickeli, 1874)

A short list of the species of *Biomphalaria* probably occurring in each region of Africa is appended. The Study-Group recommends the provision of photographs of typical forms to supplement these lists for field workers.

The report then surveys the techniques of collection, labelling and preservation which should be applied to field samples of vectors intended for taxonomic purposes. Examples of labelling schedules and of methods of fixation of material intended for the study of the anatomy of the soft parts of the snail are given. [The technique of fixation and preservation considered best is that already given in this *Bulletin*, 1955, v. 52, 276.] The Study-Group make several recommendations on the course of future research, stressing the need for the compilation of a file of the original descriptions of vector snails and closely-related forms. It is emphasized that the nomenclature adopted *must* conform with the International Rules of Zoological Nomenclature. The need for international coordination, and the importance of training specialist malacologists, are both stressed.

[To workers concerned with the snail-borne diseases, this report will be of major value. The nomenclature down to the level of subgenera is crystallized almost entirely satisfactorily. If the recommendations of the Study-Group with regard to the collection and preservation of material and future research are implemented, the gaps and dubieties of their present list of vector species can be resolved.] *W. Russell Hunter*

El-Gholmy, A., Nabawy, M., Gabr, M., Aidaros, S. & Omar, A. **Hepatic Schistosomiasis in Children.** *J. Trop. Med. & Hyg.* 1955, Feb., v. 58, No. 2, 25–33, 8 figs. [12 refs.]

A comprehensive clinical, radiological and pathological study was conducted on 127 children suffering from schistosomiasis—100 males and 27 females. Their ages varied from 5 to 16 years and all had urinary *Schistosoma haematobium* infection; 19 suffered from additional schistosomiasis, of whom 11 had *Schistosoma haematobium* and 8 *S. mansoni* in their stools.

The incidence of hepatomegaly and splenomegaly in the 127 cases was determined, other causes than schistosomiasis being excluded. The liver was enlarged in 22 per cent. of the cases, both liver and spleen in 18 per cent. and the spleen alone in 9·5 per cent. The liver and spleen were normal in 50·5 per cent. Liver function tests revealed that 24·5 per cent. had altered function, but these tests were regarded as too unreliable to be of value. Liver punch biopsy was performed on 33 cases by the Vim-Silverman method and 78·8 per cent. showed definite evidence of schistosomiasis. The 33 biopsy cases were composed of 29 males and 4 females, in all of whom *S. haematobium* was present and 12 were infested in addition with *S. mansoni*. Pathological evidence of hepatic involvement by the disease was accepted only if ova or pigment were present and on this basis 26 cases showed schistosomiasis (78·8 per cent.). These results, summarized as follows, show the superiority of biopsy material in recognizing hepatic involvement in the disease:

Examination	*No. of Cases*	*No. Positive*	*% Positive*
Clinical	127	51	40
Laboratory	77	19	24·5
Biopsy	33	26	78·8

As a result of their study the authors classified the disease into four pathological stages:

(1) *Pre-cirrhotic stage* characterized by schistosomal tissue which may be either diffuse or localized (" bilharziomata ") with the presence of ova, giant cells and eosinophils (2 cases);

(2) *Stage of early cirrhosis*, a stage further in the progress of the pathology, in which a fibroblastic proliferation as well as an inflammatory tissue reaction occurs (13 cases);
(3) *Stage of established cirrhosis* in which cellular infiltration is minimal (7 cases);
(4) *Stage of advanced cirrhosis* showing a high degree of fibrosis with marked thickening of the portal tracts (4 cases).

In the first 3 stages of the disease the liver or spleen or both may appear normal clinically in spite of their pathological changes. But all the cases in the fourth stage presented clinical evidence of liver cirrhosis and splenomegaly.

The authors investigated the degree of correlation between those cases showing schistosomal disease histologically and the functional derangement of the liver as determined by the flocculation and serum protein tests. The blood protein and thymol turbidity tests were within the normal range in all the cases, but the Takata-Ara was positive in 10, thus showing that often in hepatic schistosomiasis the liver function tests are normal. They also observed lack of correlation between the degree of schistosomal affection of other organs and the stage of hepatic schistosomiasis.

They also proceeded to determine by means of direct portal manometry and splenic venography whether there was any relationship between the degree of portal hypertension and the stage of hepatic schistosomiasis. Manometry was performed on 3 cases of advanced cirrhosis during splenectomy and this revealed a raised portal pressure of 280–330 mm. saline. In 10 of the 33 patients on whom liver biopsies were performed, splenic venography was done. By estimating the tortuosity of the splenic vein and the filling of the collaterals of the splenic and portal veins, they were able to judge the extent of the hypertension in the portal system. A definite correlation between the degree of hepatic fibrosis and portal hypertension was evident in 8 of the 10 cases thus examined. Venography revealed that the degree of portal hypertension was proportionate to the degree of fibrosis.

The authors arrive at the following conclusions: (1) that liver punch biopsy is of help in recognizing the presence of schistosomal disease in this organ and from it the effects of treatment can be gauged; (2) that late and severe hepatic complications, such as cirrhosis, are more likely to follow *S. mansoni* infections than those of *S. haematobium* probably because of the greater ease with which ova can reach the liver; (3) that a marked diminution in the size of the liver and spleen follow treatment only in the pre- and early cirrhotic stages of the disease. *M. Gelfand*

Hoffman, D. O. & Zakhary, R. **A Study of Water Temperatures in a Representative Egyptian Canal in Connection with Schistosomiasis Control.** *J. Egyptian Med. Ass.* 1954, v. 37, No. 8, 963–7, 5 figs. on 4 pls.

In view of the fact that temperature is one of the most important environmental factors determining the efficiency of molluscicides, a study was made of the fluctuations in temperature in a representative Egyptian irrigation canal over a period of a year. A Taylor bimetallic 7-day recording thermometer in a water-tight container was suspended from anchored floats and submerged 15 inches below the surface of the water.

The record showed a range of variation from 32·2°C. in July and August to 7·8°C. in January. The highest average (29·6°C.) was in August, and the lowest (11·4°C.) in January. Daily fluctuations were somewhat larger in

summer than in winter, but were very much smaller than variations in air temperature, while the monthly water temperature was higher during summer and lower during winter than the corresponding air temperature.

The data indicate that the monthly average water temperature may show a seasonal variation of at least 18°C. instead of 12°C. as previously estimated. It is, therefore, suggested that, so far as possible, molluscicides should be applied during the hot summer months when their efficiency will be greatest.

T. H. Davey

Litalien, F. & Deschiens, R. Comportement de mollusques vecteurs des bilharzioses en présence de nitrates et de nitrites alcalins. [**Behaviour of Snail Vectors of Schistosomiasis in the Presence of Alkaline Nitrates and Nitrites**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 4, 525–31.

The effects of different concentrations of nitrate and nitrite of potassium and sodium were tested against *Planorbis* [*Australorbis*] *glabratus* and *Bulinus contortus* in aquaria of 2 litres capacity. In each vessel were placed 6 *P. glabratus*, 6 *B. contortus* and one fish (*Carassius auratus*) plus one of the salts of the concentration to be tested. Similar vessels were set up in which the water was kept aerated, and control vessels were also set up. In the first experiment the 4 salts were in a solution of 0·1 gm. per 1,000 cc. After 6 days no effect was observed on any of the snails, but the fish died in 3 days in the sodium nitrite solution and in 2 days in the potassium nitrite solution. In the aerated vessels, however, the fish survived. In the second experiment the 4 salts were used in a solution of 0·5 gm. per 1,000 cc. and the results are tabulated. These show that *P. glabratus* was more susceptible than *B. contortus* to the effects of the nitrates and the nitrites and both species were more susceptible to the nitrites than the nitrates. In the aerated vessels the lethal effect of the salts was reduced. In the third experiment the concentration used was 1 gm. per 1,000 cc. The authors' summary in French is based principally on this experiment and is translated freely as follows:

The presence of nitrates and nitrites in natural waters upsets the ecology of the snail vectors of schistosomes. The nitrates seem to be better tolerated by *P. glabratus* and *B. contortus* than are the nitrites. Both sodium nitrite and potassium nitrite at 1 gm. per 1,000 cc. kill *P. glabratus* in 24 hours and *B. contortus* in 2 days. Sodium nitrate and potassium nitrate at 1 gm. per 1,000 cc. kill *P. glabratus* in 4 to 5 days and *B. contortus* in 5 to 6 days. On an average *Bulinus* has a greater resistance than *Planorbis* to the nitrites and nitrates.

J. J. C. Buckley

Texera, D. A. & Vicente Scorza, J. Investigaciones sobre una forma bacteriana parecida al *Bacillus pinotii* hallada en Venezuela con acción patógena sobre el *Australorbis glabratus* Say. [**Studies on a Bacterial Type resembling** *Bacillus pinotii* **found in Venezuela and having a Pathogenic Action on** *Australorbis glabratus*] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1954, Mar., v. 2, No. 2, 235–42, 1 fig.

The English summary appended to the paper is as follows:—

" 1. The authors report preliminary results obtained in Venezuela with the method developed in Brazil by Dr. Emmanuel Dias of the Instituto Oswaldo Cruz for the control of the snail vector of Bilharziasis (*Australorbis glabratus* Say) by means of artificial infections with mass cultures of spore-forming bacteria isolated from the same molluscs when these showed symptoms of an

epidemic hemorrhage which infects them in their natural environment in Brazil [this *Bulletin*, 1953, v. 50, 825; 1954, v. 51, 284].

" 2. In a survey of some 40 foci of *A. glabratus* in the outskirts of Caracas and the north-central section of the country, they found one in the State of Aragua where the snails showed symptoms similar to those of the epidemic hemorrhage described by Dias.

" 3. A sequence of serial inoculations or passes was initiated in the laboratory with these animals into healthy ones of the same species brought from a distant place and the mortality rate observed ranged from 20% in the first pass to a peak of 80% in the fifth and a subsequent decline to 35% in the ninth. Parallel inoculations performed with non-hemorrhagic animals failed to produce the infection.

" 4. Always following the methods described by Dias, a spore-forming of hemorrhagic snails and the serial inoculations started with the pure culture of this organism caused mortality rates varying from 34% to a maximum of 64% with a subsequent drop to 34% at the eleventh pass. A second spore-forming bacillus isolated from the same hemorrhagic animals and identified as *Bacillus megatherium*, was used as control in a parallel series of inoculations but failed to produce the disease."

Okabe, K., Koga, Y., Shibue, H. & Matsuse, M. **Immunological Studies on Schistosomiasis japonica. 3. Intradermal and Precipitin Tests for Schistosomiasis japonica.** *Kurume Med. J.* 1954, v. 1, No. 2, 85–9.

In *S. japonica* infections the eggs of the fluke cannot always be found and another method of diagnosis is desirable. The authors tested the value of intradermal and precipitin reactions.

Antigen was prepared by infecting rabbits with cercariae of *Schistosoma japonicum*. Adult flukes derived from these were washed in several changes of physiological saline and dried in a desiccator. The dried flukes were pulverized in a mortar and suspended in Coca's solution (0·5 per cent. NaCl, 0·5 per cent. $NaHCO_3$ and 0·4 per cent. phenol) at the rate of 1 in 100 and put in the ice-box for 24 hours. The suspension was centrifuged at 1,800 r.p.m. for 15 minutes and a portion of the supernatant was preserved.

For the intradermal test the antigen was diluted 1 in 10,000 with saline and 0·1 cc. was injected intradermally. When the reaction was positive, it appeared in 10–15 minutes. This test was tried on 2,621 chronic cases in the centre of an endemic area and 66·6 per cent. were positive. Of 2,540 persons tested at the perimeter of the area 25·5 per cent. were positive; of 4,199 persons tested immediately outside the area 21·2 per cent. were positive. The authors have been using this test for mass-screening, especially of people in the outer part of the area or outside it. In many acute cases the test was negative, especially in febrile cases. When the antigen was diluted 1 in 1,000, the results were the same as those obtained with a dilution of 1 in 10,000. The positive reaction seems to appear 2 months after infection.

When the Chikugo river flooded the hospital in which the authors worked, 3 nurses became infected with *S. japonicum*. The intradermal test was then applied to 219 nurses about 2 months after the flood. Of 19 nurses who did not enter the water to rescue patients from the flooded wards, 4 (21·1 per cent.) were positive; of 200 nurses who did come into contact with the flood-water 23 per cent. were positive. Of 40 nurses who washed in the Chikugo river 20 (50 per cent.) were positive and 3 became ill. Of 160 nurses who entered the water only in the hospital 16·2 per cent. were positive. Before

the flood *Oncomelania* (species not stated) were found in grass plots in the Chikugo river.

For the precipitin test about 0·1 cc. of the patient's serum was put in a small precipitin tube and an equal amount of antigen was layered on to the serum. The antigen was diluted with sterile saline to 1 in 100, 1 in 200, 1 in 400, 1 in 800, 1 in 1,600, 1 in 3,200 and 1 in 6,400. The tubes were incubated for 2 hours at 37°C.

Of the 19 acute cases tested, all were positive at a dilution of 1 in 800; in 7 cases a strongly positive reaction occurred at a dilution of 1 in 6,400. A table shows the results obtained in 10 of these cases. It shows that all but 2 of these were positive at a dilution of 1 in 1,600, one being doubtful and the other negative, 6 were positive at 1 in 3,200, 5 at 1 in 6,400 and all were negative at 1 in 12,800.

For testing the 23 chronic cases dilutions of 1 in 100 to 1 in 8,000 were used. All but 1 of the 23 were positive at 1 in 800. A table shows the results obtained with 10 of these cases. Of these 10, 7 were positive at 1 in 1,000, 2 were doubtful and 1 negative; at 1 in 2,000 only 1 was positive, 2 being doubtful and the rest negative. At 1 in 4,000 only 1 was positive and at 1 in 8,000 all were negative.

The authors thought that 3 doubtful cases tested were infected, although they did not excrete eggs: all these were positive at a dilution of 1 in 800 and one was positive at 1 in 1,000. Of 8 normal persons 5 were positive and 3 negative at a dilution of 1 in 400.

The authors conclude that the precipitin test is a good supplementary method of diagnosis. *G. Lapage*

Yoshizumi, Y. **A New Diagnosis of Schistosomiasis japonica by Needle Biopsy of the Liver.** *Kurume Med. J.* 1954, v. 1, No. 2, 118–28, 10 figs.

Inoue *et al.* (*Kyusyu Med. College Bulletin*, 1916, v. 6, 213) concluded that eggs of *Schistosoma japonicum* derived from emboli in the intestine are found in the faeces of only 70 to 80 per cent. of patients. Eggs in emboli in the liver may be found by needle biopsy of the liver [this *Bulletin*, 1954, v. 51, 1076; *ibid.*, 1950, v. 47, 380]. The author uses it for detecting eggs in doubtful cases and the method has enabled him to find the eggs far earlier than is possible by faecal examination. A small Silverman needle is used. The bleeding and coagulation times are determined before puncture and, to prevent haemorrhage in normal cases, 20 cc. of 20 per cent. glucose containing 100 mgm. of vitamin K are injected intravenously. If the bleeding time and coagulation rate are abnormal, vitamin K is given for a few days until normal values are obtained. The local skin is sterilized and the injection site, *i.e.*, the 8th intercostal space in the right mid-axillary line, is anaesthetized with Novocain and disinfected with 200,000 units of penicillin G. The needle point is thrust in slightly upwards. The needle reaches only the peripheral part of the liver, so that there is no risk of damaging the portal veins, gall-bladder, etc. A small part of the liver tissue removed is put on a slide and 2 drops of saline are added and the preparation is examined. Eggs may thus be found in 2 to 3 minutes. The remainder of the tissue removed is fixed and embedded for sectioning.

The author gives 8 photographs showing the eggs in histological preparations and in the freshly-extracted liver tissue.

He gives clinical details of 10 patients, all but 3 of whom had previously had "Stibnal" injections for suspected schistosomiasis. Examination of

the faeces failed to detect eggs in 8, but needle biopsy detected them in all 10 cases, eggs being also present in the histological preparations made from 9 of these cases. Several eggs, or even scores of them, may be found, so that the total number of eggs in the liver must be enormous. The method, however, examines only a small part of the liver, so that negative results do not exclude possible infection. *G. Lapage*

Hsü, H. F., Hsü, S. Y. L. & Chu, K. Y., with the technical assistance of T. C. Huang, C. T. Tsai & Y. W. Wang. **Schistosomiasis japonica among Domestic Animals in Formosa.** *Riv. di Parassit.* Rome. 1954, Oct., v. 15, No. 4, 461–71. [17 refs.]

The English summary appended to the paper is as follows:—

"1. There is evidence that the *Schistosoma japonicum* in Formosa is a non-human strain. To determine the natural definite hosts of the endemic area, 100 dogs, 455 water buffaloes, 230 goats and 1,522 pigs were examined. The incidence of infection was found as follows: dogs: 62 per cent.; water buffaloes: 3·5 per cent.; goats: 1·7 per cent. and pigs: 2·6 per cent.

"2. As dogs have the highest incidence of infection, the possibility of regarding the non-human *S. japonicum* strain in Formosa as a canine strain is discussed.

"3. In making a survey for the incidence of *S. japonicum* infection in domestic animals, the KOH liver digestion method was the most accurate. If only stool can be obtained for examination, the hatching method is highly recommended.

"4. The apparent marked decrease in the incidence of *S. japonicum* infection in pigs over the past 38 years is probably due to changes in the methods used in the care of these animals.

"5. The incidence of *S. japonicum* infection in dogs, water buffaloes, goats and pigs in various *S. japonicum* endemic areas in the Orient is tabulated and discussed."

Mitchell, J. C. **Schistosome Dermatitis. Report of an Outbreak of "Swimmers' Itch".** *Arch. Dermat. & Syph.* 1954, Dec., v. 70, No. 6, Sect. 1, 805–8.

Of a number of persons bathing in Lake Nipissing, Ontario, on one day in June 1953, a batch of 53 suffered from attack by non-human schistosome cercariae. Seven first noticed skin irritation while in the water, 45 between 10 minutes and 3 hours after leaving it, and one person on the following day. Most of these patients were examined within half an hour of the onset of itching; many then had no visible lesions other than those produced by scratching, but some had weals. The itching was so severe in some children that they were difficult to manage; it reached its peak of intensity in half an hour and then gradually subsided. It seems that the itching disappeared within 6 hours in 21 cases, it lasted for a day in 5, and for more than 24 hours in 22 cases. Of these 22, 18 suffered for up to 6 days and 4 for more than 7 days. The course of the physical manifestations was the appearance of weals, followed by bright red macules which became papular and sometimes vesicular, and even pustular in some cases as a result of scratching.

Snails obtained from rocks at the bathing site were found freely to

discharge cercariae; these were apparently furcocercous. The infected snail was identified as *Stagnicola catascopium* (Say). Biopsies of affected skin of two patients showed a cellular exudation around the small vessels, but no parasites were recognized in the sections. Three volunteers were exposed to attack by one or two cercariae, but suffered no consequent reaction. The author discusses the effects of sex, of the nature and duration of exposure to infection, and of drying on the course of the infection.

[The author mentions only 3 papers in the literature on this subject and none of these is very recent. Cort (this *Bulletin*, 1951, v. 48, 482) has done more than anyone else to collect and to collate information on schistosome dermatitis.] *A. R. D. Adams*

Mackie, A., Stewart, G. Marjorie, Cutler, A. A. & Misra, A. L. *In vitro* **Tests of Chemical Compounds on** *Ascaris lumbricoides* **and** *Fasciola hepatica*. *Brit. J. Pharmacol. & Chemotherapy*. 1955, Mar., v. 10, No. 1, 7–11. [17 refs.]

"1. Derivatives of 2:3-dihydro-3-ketobenzo-1:4-thiazine, phenothiazine and rhodanine, and some miscellaneous compounds, have been tested *in vitro* against *Fasciola hepatica* and the anterior preparation of *Ascaris lumbricoides*.

"2. 2:3-Dihydro-3-ketobenzo-1:4-thiazine derivatives showed only depressant effects, when active, towards *A. lumbricoides*, but paralysant effects were observed with some derivatives, particularly the 6-bromo-compound, on liver fluke. Increase in the length of the side-chain usually decreased the anthelmintic potency towards liver fluke.

"3. Some of the aminoacetylphenothiazines were active against liver fluke, and β-10-phenothiazinylpropionic acid was lethal.

"4. 5-*iso*Nitroso-3-allylrhodanine was the only rhodanine derivative which paralysed *Ascaris*, but some, especially the benzylidene compounds, were lethal to the liver fluke.

"5. Amongst the miscellaneous compounds the following were very active: allyl iodide and sodium azide against *Ascaris*; carbon tetrabromide; benzene hexachloride; allyl iodide and *iso*thiocyanate; mercuric chloride; ethylmercuric chloride; ethoxyethylmercuric chloride; diphenylamine, and *p*-nitrophenol against liver fluke."

Burrows, R. B. & Klink, G. E. **An Abnormal Proglottid of** *Taenia saginata*. *J. Parasitology*. 1955, Feb., v. 41, No. 1, 56–8, 1 fig.

Siurala, M. **Gastric Lesion in some Megaloblastic Anemias: with special reference to the Mucosal Lesion in Pernicious Tapeworm Anemia.** *Acta Med. Scandinavica*. 1954, v. 151, Suppl. 299, 47 pp., 19 figs. [64 refs.]

The principal interest to readers of this *Bulletin* of this monograph from the University of Helsinki lies in the comparison of gastric mucosal changes in pernicious tapeworm anaemia (PTA) with those in addisonian pernicious anaemia (APA) and idiopathic atrophic gastritis (AG), together with investigation of possible correlation between these changes and the ability to secrete HCl in PTA. Gastroscopic and histological examinations were made. In all, 88 cases of megaloblastic anaemia were studied, 63 being PTA. The

controls consisted of 66 tapeworm carriers without anaemia and 45 cases of AG.

Both methods of examination showed that atrophic mucosal lesions were significantly more frequent in PTA than in the controls. They occurred in all cases of APA. This histological picture differed in APA from that in AG, the former showing degenerative changes to be predominant while in the latter inflammatory changes were more marked. In most cases of PTA inflammatory changes dominated the histological picture, though in some the appearances were more like those of APA.

There was a fairly good correlation between the mucosal lesion and secretion of HCl in PTA: yet in AG, with roughly the same degree of mucosal change, achlorhydria was significantly less common. This suggests that other factors may contribute to the frequency of achlorhydria in PTA. Possible explanations of the pathogenesis of these changes are discussed. Fifteen illustrative cases are presented and each is accompanied by one or more beautiful photomicrographs. *H. J. O'D. Burke-Gaffney*

Simitch, T. & Petrović, Z. La question de l'identité ou de la dualité de *H. nana* et le rôle des rongeurs dans l'infection de l'homme par ce parasite. [**The Question of the Identity or the Duality of** *Hymenolepis nana* **and the Rôle of Rodents in Human Infection**] *Bull. Acad. Serbe des Sci.* Belgrade. 1954, v. 11 (n.s.), Classe Sci. Méd., No. 2, 83–4.

The authors, in Yugoslavia, gave eggs of human *Hymenolepis nana* orally to 30 *Citellus citellus*, of *H. nana* var. *fraterna* of murine origin to 21, and of *H. nana* from a naturally infected *C. citellus* to 15. After 2 weeks stools were examined for infection. Eggs were found in all the animals from the third week onwards. It was therefore concluded that human *H. nana* and murine *H. nana* var. *fraterna* belong to the same species.

In another series of experiments, it was shown that *C. citellus* carrying *H. nana* could be reinfected not only with heterologous but with homologous strains. The animals infected experimentally died regularly and their intestines were filled with parasites at all stages of development.

Nevertheless, the authors consider that rats and mice do not represent an important source of infection of man by *H. nana*, despite the fact that man and rodents harbour the same species of *Hymenolepis*.

H. J. O'D. Burke-Gaffney

Peña García, B. Presencia del *Ancylostoma duodenale* (Dubini, 1843) asociado al *Necátor americanus* (Stiles, 1903) en casos de anquilostomiasis observados en Maracaibo (Estado Zulia, Venezuela). [**Presence of** *Ancylostoma duodenale* **associated with** *Necator americanus* **in Cases of Ankylostomiasis seen in Maracaibo, Venezuela**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1954, Mar., v. 2, No. 2, 245–54, 4 figs. [16 refs.]

The following is a translation of the author's summary:—

The association of *Ancylostoma* and *Necator* is described in cases seen in the Central Hospital "Dr. Urquinaona" in Maracaibo, Venezuela: both parasites were identified as agents causing the endemic which prevails in rural Venezuela, and the author proposes that in the examination of faeces the family *Ancylostomidae*, which includes both genera, should be reported as an entity. *H. J. O'D. Burke-Gaffney*

Yoshida, Y., Urabe, A., Kawahira, Y., Kawamoto, S., Watanabe, K., Mitani, W., Fujita, H., Izumi, M., Aono, H., Masaki, Hideo & Masaki, Hinako. [**Studies on the Helminths (especially of Hookworm) in a Village of Kagawa Prefecture. Report 2**] *Shikoku Acta Med.* 1954, Dec., v. 5, No. 6, 52–8. [25 refs.] [In Japanese.]

The English summary appended to the paper is as follows:—

"1. In a village of Kagawa prefecture studies were carried out from July, 1952 to June, 1954.

"2. Faeces were examined six times during the studies, by smear as well as flotation method with saturated NaCl solution.

"3. Incidence and new infection of hookworm were higher in adults than younger ages.

"4. Ancylostoma duodenale predominates, but certain infection of Necator americanus was met with in earlier examinations, while in the later examinations the latter species was not found. This result seems to show an easier eradication of N. americanus infection than that of A. duodenale.

"5. During cooler season, January and March, we have found several times encysted larvae of A. duodenale in the soil of this village. It may suggest a possibility of infection of this hookworm during winter."

Fairbairn, D. **Embryonic and Postembryonic Changes in the Lipids of *Ascaris lumbricoides* Eggs.** *Canadian J. Biochem. & Physiol.* 1955, Mar., v. 33, No. 2, 122–9, 1 fig. [13 refs.]

Fairbairn, D. & Passey, B. I. **The Lipid Components in the Vitelline Membrane of *Ascaris lumbricoides* Eggs.** *Canadian J. Biochem. & Physiol.* 1955, Mar., v. 33, No. 2, 130–34. [14 refs.]

See also p. 664, Mackie *et al.*, *In vitro* **Tests of Chemical Compounds on *Ascaris lumbricoides* and *Fasciola hepatica*.**

Hartz, P. H. Complicaciones de la ascaridiosis infantil. [**Complications of Ascariasis in Children**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1954, Mar., v. 2, No. 2, 209–11.

The English summary appended to the paper is as follows:—

"The author describes two cases of infantile ascaridiosis with grave complications due to the invasion of biliar and pancreatic ducts by immature parasites."

Dunn, T. L. **Effect of Piperazine Derivatives on certain Intestinal Helminths.** *Lancet.* 1955, Mar. 19, 592–3.

A survey of the incidence of roundworms and hookworms in coastal areas of New South Wales led the author to seek methods of treatment less toxic than those in use and more suitable for mass therapy. The drugs tested were diethylcarbamazine (Hetrazan, Banocide), piperazine hydrate (Antepar) and piperazine adipate (Entacyl). The patients were children aged 1

to 14 years and eggs were detected by salt flotation. The highest egg counts before treatment were *Ascaris*, 153,000, *Necator*, 54,000, and *Trichuris* (*Trichocephalus*), 13,000 per gm. of faeces. The following table shows the dosages used and the effects noted on *Ascaris lumbricoides* and *Trichuris trichiura*.

Results of Treatment

Drug	*Daily Dose* (mgm.)	*Duration of Treatment* (days)	*Number of children treated*	*Number of children ova-free 2½ weeks after treatment*
Ascaris lumbricoides				
Diethylcarbamazine	13 per kgm. of body weight	3	54	12 (22%)
Piperazine hydrate	75 per kgm. of body weight	3	26	20 (77%)
Piperazine adipate	300 per year of age (max. 1,800) [about 75 per kgm. of body weight]	3	47	45 (95%)
Trichuris trichiura				
Piperazine hydrate	75 per kgm. of body weight	3	22	4 (18%)
Piperazine adipate	300 per year of age (max. 1,800)	3	31	28 (90%)

In those not cured by piperazine adipate the eggs of both *Ascaris* and *Trichuris* were "extremely scanty" after treatment. The maximum number of ascarids passed was 59. Counts of the eggs of *Necator americanus* were not changed in 41 children treated with diethylcarbamazine, in 28 treated with piperazine hydrate and in 7 treated with piperazine adipate, and piperazine adipate had no effect on *Hymenolepis nana* present in 4 children. Children treated with the soluble hydrate passed most of their worms early on the second day of treatment, but with the less soluble adipate the evacuation of worms extended to the third or fourth days. When infections were multiple, *Trichuris* was voided earlier than *Ascaris*.

Diethylcarbamazine was too toxic to be given in effective doses, but the other two drugs caused no toxic or unpleasant effects. The daily dose in all cases was given as a single dose, not a divided one as the makers of the drugs recommend, and no aperient were given. Trial doses of 25–55 mgm. per kgm. body weight of piperazine hydrate given to some children

with ascariasis for one, two or three days, produced very variable results, a single dose of 25 mgm. per kgm. body weight being enough, in some cases, to cause disappearance of the eggs, whereas in other cases this was quite ineffective. Possibly food intake may have affected the results.

The results show that diethylcarbamazine is unsatisfactory for the treatment of ascariasis. Piperazine is effective against *Ascaris* in a large proportion of cases, but not against *Trichuris*, while piperazine adipate is effective against both. The absence of toxic reactions suggests that further tests may show that more massive and fewer doses may be both safe and effective and premedication or regulation of food intake may improve the action of piperazine adipate. Further investigation is in progress. *G. Lapage*

Cavier, R. & Savel, J. Étude de quelques aspects du métabolisme intermédiaire des acides aminés chez l'*Ascaris* du porc (*Ascaris lumbricoides* Linné, 1758). [**Some Aspects of the Intermediate Metabolism of Amino Acids in Pig** *Ascaris*] *Bull. Soc. Chimie Biol.* 1954, v. 36, Nos. 11/12, 1631–9. [16 refs.]

Jordan, P. **Filariasis in the Central Province of Tanganyika.** *East African Med. J.* 1955, Jan., v. 32, No. 1, 15–16.

The survey on which this note is based was part of the wider filariasis survey of East Africa now being carried out by the Filariasis Research Unit of the East Africa High Commission [this *Bulletin*, 1954, v. 51, 1180].

The Central province of Tanganyika has no coastline and no large lakes and is mostly situated at an altitude of 4,000–5,000 feet. The rainfall is usually 20–30 inches, the mean maximum temperature 80–85°F. and the minimum 60–65°F. The mean annual vapour pressure is low, being 17–19 millibars. During the present survey, extremely dry conditions prevailed owing to earlier failure of the rains.

In 10 villages visited, 2,623 night blood specimens were obtained, about one-quarter being from children under 16 years. Microfilariae of *W. bancrofti* were found in only 2 and it seems that these may not have been indigenous infections. Only 7 cases of hydrocele and 4 of elephantiasis were seen.

The almost complete absence of evidence of *W. bancrofti* infection in central Tanganyika is in accord with usual experience that satisfactory completion of the filarial cycle in the mosquito requires a high temperature and a high relative humidity. Even then, the absence of any large expanse of water and the low rainfall in the present case would produce conditions unsuitable for transmission.

The author [this *Bulletin*, 1954, v. 51, 199] had previously recorded a focus of *W. bancrofti* infection at Kimande in the north of the Southern Highlands province of Tanganyika, which lies south of the Central province. During the present survey, an attempt was made to define the northern limit of this focus; but no evidence of filariasis was found at two places in the Central province situated respectively 60 and 40 miles from Kimande. It would seem that the Kimande focus is very small and perhaps localized in the area immediately adjacent to the great Ruaha River, which runs through part of the Southern Highlands province.

H. J. O'D. Burke-Gaffney

Arakawa, Y., Aburaya, Y., Morikawa, Y., Kaneko, Y., Miyamato, M., Kochi, K., Miyagawa, M., Nakase, M. & Yamaguchi, T. [**On the Filariasis in Misaki Peninsula, Ehime Prefecture**] *Shikoku Acta Med.* 1955, Jan., v. 6, No. 1, 20–24, 2 figs. [In Japanese.]

The English summary appended to the paper is as follows:—

" From 5 to 8 Sept. 1954, authors studied on filariasis of Misaki district, tip of the Misaki Peninsula in Ehime Prefecture, and results of epidemiological and clinical survey were as follows.

" 1) Of the 760 persons examined 11 or 1·5% were showed positive for microfilariae of *Wuchereria bancrofti* in thick blood films.

" 2) Of the 246 persons examined with clinical aspect, 14 or 5·69% were showed as chronic stage of the filariasis, scrotal hydropsy and chyluria.

" 3) A total of 84 mosquitoes of 3 species, *Armigeres subalbatus*, *Culex tritaeniorhynchus* and *Anopheles hyrcanus* var. *sinensis* which collected in Misaki, were studied and no larvae detected in mosquitoes."

Woodhill, A. R. **Experimental Crossing of** *Aëdes* (*Stegomyia*) *pseudoscutellaris* **Theobald and** *Aëdes* (*Stegomyia*) *polynesiensis* **Marks (Diptera, Culicidae).** *Proc. Linnean Soc. of New South Wales.* 1954, v. 79, Pts. 1/2, 19–20.

The members of the " *scutellaris* group " of *Aëdes* provide a number of systematic puzzles in Oceania: there is a tendency for endemic subspecies to develop in particular archipelagos. Marks [this *Bulletin*, 1952, v. 49, 168] described a new species, *polynesiensis*, with a wide range from Fiji eastwards, distinguished (on small but apparently constant characters) from *pseudoscutellaris*, which in this restricted sense occurs only in Fiji.

The author has crossed *polynesiensis* (from Tahiti) with *pseudoscutellaris*, putting over 100 males of the one and about as many females of the other in a cage, making the crosses reciprocal, and enumerating number of eggs laid, and percentage hatching. Either parent species, under these conditions, lays some 6,000 eggs, with a 92–95 per cent. fertility. The cross in which *polynesiensis* is the female parent produces 1,200 to 1,700 eggs, 4·8–36·6 per cent. fertile. The reverse cross produces fewer eggs. The hybrids were fertile and produced an F_2 generation. In general their characters were variable and intermediate.

It would, as the author says, be of interest to know what happens in Fiji where both species occur. [See also this *Bulletin*, 1951, v. 48, (412).]

P. A. Buxton

See also p. 695, Paulini & Ricciardi, **The Repellent Effect of Pyrethrin Vapour to** *Culex fatigans*.

Ikejiani, O. **Studies in Onchocerciasis. (I) The Use of** *Dirofilaria immitis* **Antigen in the Diagnosis of Onchocerciasis in West Africa.** *West African Med. J.* 1954, Sept., v. 3 (n.s.), No. 3, 135–7.

An antigen from *Dirofilaria immitis* was used in a dilution of 1:100,000 and 0·02 cc. was injected intradermally. The development of a weal and possibly pseudopodia within 20–30 minutes was taken as a positive reaction. Delayed reactions consisted of erythema and induration some 24 hours later. Altogether 214 cases of onchocerciasis were examined. The skin reaction was positive in 192, and in the other 22 there was a delayed reaction.

Forty-five persons free from *Onchocerca* but infected with *Ascaris* and also other intestinal helminths were tested, and 35 gave positive reactions. Ten normal persons, who were free from intestinal helminths, were examined and 2 gave positive reactions. It is concluded that the test is not specific and has no practical value in Nigeria. [A much simpler test for onchocerciasis is provided by the administration of a small dose, *e.g.*, 50 mgm., of diethylcarbamazine (Hetrazan, Banocide); if *Onchocerca* is present, there is a febrile reaction with pruritus and swelling of the inguinal lymph glands during the next 24 hours.] *F. Hawking*

Ikejiani, O. **Studies in Onchocerciasis. (II) The Use of Hetrazan (Banocide) in the Treatment of African Onchocerciasis.** *West African Med. J.* 1954, Sept., v. 3 (n.s.), No. 3, 138–44, 3 figs. [25 refs.]

The author treated 214 cases of onchocerciasis with diethylcarbamazine (Hetrazan). Half of the patients were given 2 mgm. per kgm. once on the first day, twice on the second and then thrice daily for 12–33 days. [Presumably these doses refer to the citrate salt, which contains about half its weight of base.] Sixty-five patients were given similar doses of 6 mgm. per kgm. and 42 were given 10 mgm. per kgm. The latter dose caused severe intestinal cramp, reduction of appetite and vertigo, and it was discontinued after a week. The average leucocyte count before treatment was 5,100 per cmm. with 35 per cent. eosinophils. During treatment there was an increase in the total leucocyte count; and there was a decrease in the eosinophils at the end of treatment. In 37 cases *Onchocerca* nodules were excised before treatment began and compared with other nodules excised at the end of treatment; microscopically the worms showed no change as a result of treatment. Systematic reactions of varying intensity occurred during the first 7 days of treatment. Skin lesions due to *Onchocerca* began to disappear from the 4th day onwards and had often disappeared completely within 2 months; but later the skin lesions began to return.

It is concluded, in agreement with many other authors, that treatment with diethylcarbamazine destroys the microfilariae but not the adult worms, so that the microfilariae and the lesions of the skin reappear some time after treatment has ceased. *F. Hawking*

Ann. Soc. Belge de Méd. Trop. 1954, Oct. 31, v. 34, No. 5, 751–95, 1 map. [23 refs.] i. Méthodes de prophylaxie de la filariose à *Onchocerca volvulus* [**Control of Onchocerciasis**] [Lebrun, A. (751–60)]; ii. **The Control of Onchocerciasis** [Garnham, P. C. C. (763–7)]; iii. L'onchocercose en A.O.F. Travail des médecins du S.G.H.M.P. de l'A.O.F. [**Onchocerciasis in French West Africa**] [Masseguin, A., Taillefer-Grimaldi, J. & Leveuf, J. J. (769–88)]; Discussion [Clark, B. M., President (789–95)].

i. In the Belgian Congo, 6 important foci of onchocerciasis can be distinguished, *viz.* Uele (infection rate up to 60 per cent. in some villages); Lomami; Sankuru-Lomami; from the Inzia to the Kwango (up to 100 per cent. infections); North Kivu; and Léopoldville. In 1949 100 per cent. of the riverine dwellers near Léopoldville were infected with *Onchocerca* and 5 per cent. had eye complications going on to blindness; in the west part of the town 45 per cent. of the Europeans had become infected and keratitis and other symptoms were becoming more common, forming a real social evil.

Accordingly, prophylaxis is urgently needed. Two drugs are known to

have therapeutic action:—diethylcarbamazine (Hetrazan) and suramin (Antrypol). But the former is of no use for prophylaxis since it does not destroy the adult worms, and suramin may prove toxic if given in large doses; moreover suramin, although it persists for a long time in the tissues, does not protect against reinfection. Accordingly it is difficult to sterilize the reservoirs of infection by those drugs. Similarly it is impossible to achieve this by excision of all nodules, for worms may exist without nodules, and the numbers of carriers are too great.

In view of all this, the most practical procedure is to try to eradicate the vector of the infection. For this purpose, it is necessary to study the habits of the local vectors in great detail, since these vary from place to place in a manner which may make all the difference to the success or failure of an eradication campaign.

In the Rapids of the Congo, just below Léopoldville, the larvae of *Simulium* find ideal conditions. They live on the stalks of *Pennisetum nodoflorum* and similar structures and the cycle from egg to adult lasts 9 days. The new insects emerge at dawn; and during the next 24 hours mating and the first blood meal of the female take place. The next 4 days are spent by the female clinging to vegetation near the streams until maturation of the egg has occurred. Under good conditions the female may pass through 2 or 3 gonotrophic cycles. If it feeds on a carrier of *Onchocerca* the larval worm becomes infective in 6 days. From all this it follows that the zones of reproduction can be treated with insecticide, while the zones of dispersion require less attention. Flies which are infected practically never fly more than 12 km. from their origin.

The Congo Rapids are too large for their flow to be alternatively diminished and increased by a barrage so as to kill the larvae. Clearing the banks of vegetation gave temporary diminution of simuliids in Léopoldville. The Congo is also too big for larvicides to be added to the stream. But with smaller volumes of water DDT in a concentration of 2–5 mgm. per cubic metre of water, and Gammexane in a concentration of 3 mgm. per litre are both very effective in destroying the larvae. The only possible procedure at Léopoldville was to try to destroy the adults near the river by means of aerial spraying, while the females were waiting the 4 days for the maturation of the eggs, or while the young adults were emerging with the dawn. Laboratory trials showed that adults were destroyed by 20 mgm. DDT or 4 mgm. Gammexane per sq. metre. A 20 per cent. solution of DDT was used in toluene and gas oil and was spread through the discharge pipes of the aeroplane. This had a residual effect which continued to be lethal for 2 days. In October 1948 a campaign of daily flights was begun to spray the rapids; this lasted for 26 days. After the first 2 days Léopoldville was practically free from *Simulium*; by 4 days, the villages for 35 km. around were free; and by the 21st day the breeding places were completely negative. Since that time Léopoldville has been practically free from these flies and all local transmission of *Onchocerca* has stopped. In 1952, further spraying was undertaken to control *Anopheles gambiae* and this would have a suppressive action on *Simulium damnosum* also.

Eighty-six children born in a nearby village since 1st January 1949 have been studied but there is no evidence of onchocercal infection. Thus the campaign of aerial spray undertaken in 1948, and which lasted only 3 weeks, has been sufficient to break the transmission of *Onchocerca*. In view of these results and those obtained by Garnham *et al.* in Kenya [this *Bulletin*, 1954, v. 51, 821], it is recommended that eradication of the insect vector is the main measure which should be undertaken for the control of onchocerciasis. Most of the great success at Léopoldville was due to the

patient work of Dr. Wanson, whose untimely death is greatly to be regretted.

ii. Control of onchocerciasis is not possible by drugs and it must be attempted by controlling *Simulium* which is very sensitive to insecticides. Such control may aim either at complete eradication of the insect, or merely at amelioration. Complete eradication is not worth attempting unless the area is isolated from other areas of infestation by the insect. It has, however, been accomplished in 3 places in Africa. One was at Léopoldville by Wanson, Courtois and Lebied [this *Bulletin*, 1950, v. 47, 647], who sprayed the area with DDT from aeroplanes for 26 days. One was in the Kodera valley, Kenya, where Garnham and McMahon [*ibid.*, 1947, v. 44, 1084] poured DDT emulsion into a stream infested with *S. neavei*. In the third case, described by Buckley [*ibid.*, 1952, v. 49, 709], *S. neavei* was eradicated from an area in Kenya by discriminative bush-clearing, all the undergrowth and smaller trees from the banks of two fly-infested rivers being removed. Other campaigns by adding larvicides to the water have been made at Jinja on the Nile (against *S. damnosum*) and in the Kakamega Forest (against *S. neavei*) with fair success. Two factors are necessary for success in such campaigns—careful survey of the area in question, and adequate organization to apply insecticide over the whole area within, say, 14 days (so as to prevent spread of the flies from the untreated areas back into the treated ones). Other methods of amelioration of infection include the systematic excision of nodules as practised in Mexico. Various methods have been used in Canada to control *Simulium* where it was a pest—mostly depending on the addition of DDT to the rivers.

iii. It is estimated that over 200,000 persons in French West Africa are infected with *Onchocerca*. Statistics are given illustrating the distribution of these. The 3 main areas of infection are the Upper Volta, the Sudan and North Dahomey. The Sudan area contains a large number of small foci scattered over a wide area. Petard has studied the sera of 26 patients with onchocerciasis at Dakar and obtains the following values in gm. per litre, the value for normal persons being given in brackets:—total protein 84–108 (82); albumin 26–56 (43); total globulins 41–67 (39); ratio albumin/globulin 0·4–1·3 (1·1); total lipids 5–8 (5·5); total cholesterol 1·4–1·9 (1·6). Thus the lipids are approximately normal but the globulin is increased, especially the gamma globulin. The alpha globulin is greatly diminished. After treatment the total globulins are reduced to a normal level but the alpha globulin remains low.

Treatment in French West Africa is a combined one. Two courses of diethylcarbamazine (Hetrazan, Notézine) are given first, each course lasting 10 days, the daily dose being gradually increased to 0·4 gm., together with Phenergan to control the allergic reactions. The interval between the courses is 10 days. Then adults are given 5 weekly injections each of 1 gm. suramin (or 10 injections of 0·5 gm. at half weekly intervals). But this long course, extending over 75 days, is difficult to complete. Nodules are excised whenever possible. Allergic reactions occur in 80 per cent. of the cases, but it is only rarely that these are serious. The results of treatment are good; both the dermal and the ocular lesions clear up. But living microfilariae can be found in about a third of the cysts after treatment. When the cases are followed up for 1½ years it is found that 70 per cent. are cured clinically and parasitologically, but 30 per cent. still have microfilariae; possibly these are cases of reinfection.

Prophylaxis by entomological means has not been possible in French W. Africa owing to shortage of staff. Limited experiments have been made

giving diethylcarbamazine once weekly, or once monthly, followed in some cases by suramin. Almost all the persons so treated were later found to be free from microfilariae [but it is not clear whether this does not represent merely suppression of the microfilariae rather than complete prevention of infection]. Mass campaigns against onchocerciasis do not seem to be feasible in French W. Africa in the near future.

During the discussion, Dr. T. F. Anderson and Mr. J. P. MacMahon described campaigns to eradicate *Simulium* in the Kakamega area of Kenya. In 1947 the attempt at eradication was not successful because several small rivers of real importance were overlooked. Two and a half years later the flies came back and extended over 2,000 square miles. A further campaign was made in 1954 and it is hoped this will be successful. The concentration of DDT in the water was kept to less than 1 part in a million, otherwise the fish were killed. Prof. J. Rodhain submitted evidence which suggested that if all the nodules had been excised, the remaining adult worms which might exist outside the nodules could be killed by diethylcarbamazine. Dr. J. Schneider said that he had injected solutions of diethylcarbamazine into nodules, but when excised 30 days later the adult worms were still living. Mr. G. A. Barnley described the operations at Jinja, Uganda, in 1952 to establish control over *S. damnosum* breeding in 42 miles of rapids in the Victoria Nile north of Lake Victoria. A dose of DDT emulsion was added to the Nile, calculated to give a concentration of one part DDT in 2·5 million parts of water over a period of 30 min. This was done from a motor launch by means of a fire pump. Eleven such applications were made at weekly intervals. The larvae for 42 miles downstream were killed in 48 hours, and within 13 days the fly catches along the Nile had become negligible. About 3 months later a few flies began to reappear but in 1954 the fly catch was still under an average of one fly per hour. Following the application of DDT the rocks in the river (which had formerly been clean) had become covered with slimy vegetation which appeared to be inacceptable as a substrate for the larvae and pupae of *S. damnosum*. The dominant *Simulium* species in the Nile rapids has been changed from *S. damnosum* to *S. adeisi*. Subsequent experience has shown that a much lower concentration of DDT would have been sufficient for this work.

F. Hawking

ERRATUM

In the abstract of the paper by R. W. Crosskey on onchocerciasis in the Galma Valley Area, Northern Nigeria [this *Bulletin*, 1954, v. 51, 1085] the statement " Microfilariae were found in 43 per cent. of female persons and in 21 per cent. of males . . ." is incorrect. The figures should be reversed, and the statement should read " Microfilariae were found in 43·7 per cent. of male persons and in 21·7 per cent. of females . . .". The correct figures are given in Table II, p. 1086. The sentence " Thus microfilariae were commoner in females and nodules in males " should be amended in the same sense.

di Egidio, M. Aspetti radiologici di *Dracunculus medinensis* calcificato. [**Radiological Aspects of Calcified** *Dracunculus medinensis*] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1955, Jan., v. 36, No. 1, 5–23 16 figs.

The English summary appended to the paper is as follows:—

" The author reports 10 cases of dracunculosis in calcified stage, examined in radiological Department of Royal Hospital in Taiz, and encloses a complete radiographic documentation.

" He establishes a classification about the most common X-Ray findings of calcified *Dracunculus medinensis*.

" He fixes the localities of Beit el Faghih (Hodeida) and Haggia as endemic places of dracunculosis in Yemen."

ALLEN, F. P., Jr. **A New Approach in the Therapy of *Enterobius* (Pinworms).** *J. Pediatrics.* St. Louis. 1955, Feb., v. 46, No. 2, 155–7. [12 refs.]

The author combined the use of rectal suppositories containing gentian violet with oral administration of gentian violet, or Diphenan or Antepar, some patients being given the gentian violet suppositories alone. The aim was to see whether increasing the concentration of gentian violet in the rectum and sigmoid colon in this way would have a better effect than oral administration of the anthelmintics alone.

The suppository was made of gentian violet 0·25 per cent. and benzocaine 2 per cent. in a polyethylene glycol base. A special dispersing agent, polyoxyethylene sorbitan monostearate, was included in the base, because it has been proved that this substance reduces the surface tension of the suppository and thus enables the gentian violet to be well distributed. Proctoscopic examination done 5 hours after insertion of the suppository

Table

	Number of Patients treated.	Patients cured Scotch-tape negative.	Patients reported symptom-free.	Patients not completing treatment. Too early for results.	Failure.	Patients requiring one repeat treatment before cure.
Patients treated	77	66*	9†	1	1	12
Gentian violet suppository and oral gentian violet	29	26	3			9
Gentian violet suppository and Diphenan	20	17	2		1	2
Gentian violet suppository and Antepar	28	23	5			1
Gentian violet suppository only	20	13			7	

* Includes 12 patients requiring repeat treatment (all cures).

† No follow-up slide made.

showed that gentian violet was present as far up as " visual reference could ascertain ". Benzocaine was included to reduce the perianal itching and relief of this also helped to prevent reinfection.

Diagnosis was made by a modification of the Scotch-tape method or by finding live worms by the mother. The parent was shown how to apply the Scotch tape and how to place it on a slide. The tape was applied 2 hours after the patient had gone to sleep and in the morning before the bowels moved, for 2 consecutive days. When worms or their eggs were found in any member of the family, the whole family had treatment. " A hundred-odd " patients not included in this report were treated prophylactically on this basis. There were no systemic reactions in any of these, nor in any of the cases reported in this paper.

Patients had oral treatment for one week, then rested one week. and then had repeated treatment for another week; the suppositories were given for 14 consecutive nights. A control group with enterobiasis were given the suppositories alone. The usual precautions for personal care and sanitation of the clothing and surroundings were observed.

The patients were aged 6 months to 12 years. The usual time from the start of the treatment until the slides were negative was 28 days. The results are shown in the table.

The author states that there was, " for practical purposes, no difference found in the effectiveness " of the 3 drugs used, when suppositories were combined with them, but he recognizes that, to establish the greater effect of one drug over another, a larger series of patients is required and that further study of the viability of the eggs during and after the use of the suppository is needed. *G. Lapage*

Howie, V. M. **Ten-Day Treatment of Pinworm Infection with Piperazine.** *Amer. J. Dis. Children.* 1955, Feb., v. 89, No. 2, 202–3.

" Fifty-eight patients with pinworms were treated with piperazine hexahydrate with dosages ranging from 56 to 133 mg. per kilogram daily for 10 consecutive days, with an 84% cure rate.

" Five patients showed possibly toxic symptoms while taking piperazine hexahydrate, and these symptoms disappeared with discontinuation of the drug."

Goeters, W. Zur Behandlung der Oxyuriasis im Kindesalter. Erfahrungen mit Uvilon. [**The Treatment of Enterobiasis in young Children. Experiences with Uvilon**] *Deut. med. Woch.* 1955, Mar. 4, v. 80, No. 9, 312–13.

The author tested the therapeutic action of the piperazine preparation Uvilon (Bayer) on enterobiasis in 42 children, in whom the Cellophane-strip method applied daily for 14 days revealed a sufficiently marked infection. The various grades of infection were not differentiated, because high-grade infections are not now so common as they formerly were, but the children chosen for treatment had an average of at least 100 eggs per anal swab.

There were 17 small children aged 2 to 6 years and 25 schoolchildren aged 6 to 14 years. Uvilon was taken without the slightest difficulty, the small children liking its taste and some of the schoolchildren saying that they took it more readily than any worm-remedy previously experienced. It

was given by the teaspoonful according to the recommendation of the manufacturers, as follows:

Age	*Daily Dose*
2–3 years	1 teaspoon
4–6 years	1½ teaspoon
7–9 years	2 teaspoons
10–12 years	2½ teaspoons
over 12 years	3 teaspoons

The daily dose was spread over the whole day and in relation to meals, the treatment lasting 7 days. After it anal strips were taken for 45 days. There were no dietetic rules and no symptoms of intolerance were noted. The treatment was not repeated.

Of the 42 children, 40 were negative during the treatment and 37 of these 40 remained free from *Enterobius* eggs for 45 days. In the 3 others eggs were found on the 28th, 34th and 37th days. Thus 37 out of 42 (88 per cent.) of the children were completely cured by Uvilon. In 2 small children who took the preparation in the form of tablets the eggs did not disappear from the anal strips, most probably because the tablets were not sufficiently sucked or chewed; but immediate administration of the fluid preparation brought about complete cure in both these children.

This result agrees with results recorded by Mouriquand *et al.* (*J. Méd. Lyon*, 1951, v. 32, 189) who, after obtaining good effects with piperazine on oxyurids of mice, treated 18 children aged 3–15 years with a piperazine elixir and stated that this was readily taken and was well tolerated by very young children; by Turpin *et al.* (*J. Thérapie*, 1952, v. 7, 108), who successfully treated 41 children with piperazine in granule form; by White and Standen [this *Bulletin*, 1954, v. 51, 86] and by Bumbalo *et al.* [*ibid.*, 1954, v. 51, 1281]. Although these authors carried out a second treatment after the 7-day one, the present author obtained the same good result with the 7-day treatment alone. The preparation he used, however, contained a higher concentration of piperazine and it must be regarded as being at present the most active therapeutic remedy for enterobiasis. It is especially good for children, because it is well tolerated and is easy to use and a fluid is the preparation of choice for children. Possibly the fluid preparation is more active, because tablets are often insufficiently sucked or chewed.

G. Lapage

Haase, K. E. Vergiftungen durch phenothiazinhaltige Wurmschokolade. [**Poisoning with Worm-Chocolate containing Phenothiazine**] *Deut. med. Woch.* 1955, Feb. 25, v. 80, No. 8, 280–83. [24 refs.]

The author adds 10 more cases of poisoning of children with *Helmetina wurmschokolade* to the cases of of poisoning with this preparation already reported by Bogner [this *Bulletin*, 1954, v. 51, 964] and by Köttgen and Kuschinsky [*ibid.*, 624]. He first briefly discusses the chemical composition and toxicity of phenothiazine and the various German preparations made for its administration to man and the dosages used. Details of the 10 cases of poisoning are then given, 3 of which were the author's cases and 7 those of Professor Voss.

The children were aged 20 months to 5½ years and received total doses of phenothiazine from 0·8 to 3·2 gm. They developed anaemia, which was of a severe haemolytic type in half the cases and required treatment by blood transfusion. The less severe cases were treated with iron. All patients recovered.

In these cases the existence of other causes of illness were excluded. It may be thought that, in the patients to whom phenothiazine had been given before, a sensitization contributed to the illness. In 4 of these cases the doses given were those recommended by the makers of the chocolate, in 2 the doses were less and in 3 more than the recommended doses. This contradicts authors who have stated that toxic effects occur only when the recommended doses are exceeded.

The paper discusses whether the toxic effects are due to the phenothiazine itself or to its oxidation products and the author quotes literature dealing with this question. He then criticizes in some detail the claims made by the makers of worm chocolate and concludes, as do the other authors mentioned above, that such preparations, which can be bought in druggists' and chemists' shops, are not to be recommended and that warnings against their use for children cannot be too emphatic. Nor has the claim that they will free patients of *Ascaris* in 2 days been substantiated. Another German firm has withdrawn its corresponding preparation, *Phenoxur*, which also contained phenothiazine. Schüffner [this *Bulletin*, 1949, v. 46, 858] claimed that self-cure without the use of drugs occurs in 80 per cent. of cases of enterobiasis.

[See also the good results obtained with piperazine by Goeters (above), by White and Standen (this *Bulletin*, 1954, v. 51, 86) and by Bumbalo *et al.* (*ibid.*. 1281). See also Davies *et al.*, *ibid.*, 1955, v. 52, 64, and, for the use of piperazine in the treatment of ascariasis, *ibid.*, 62, 63 and 64.]

G. Lapage

Rudat, K. D. Erfahrungen mit Mapha-Vermexan, einem Oxyurenmittel auf Hexachlorcyclohexanbasis. [**Experiences with Mapha-Vermexan, a Remedy for Enterobiasis containing Benzene Hexachloride**] *Ztschr. f. ärztl. Fortbildung.* 1955, Feb. 1, v. 49, No. 3, 96–8.

Lendle and Schneider [*Arch. Exper. Path.*, 1950, v. 210, 119, and this *Bulletin*, 1951, v. 48, 912], Eggers and Wilde (*Dtsch. Med. Rdsch.*, 1949, v. 3, No. 23), Brede [this *Bulletin*, 1950, v. 47, 392; see also *ibid.*, 1951, v. 48, 491] and others have obtained good results in the treatment of enterobiasis with preparations containing BHC (Gammexane). Although various authors have stated that it is practically non-toxic, others have warned against its cumulative toxic action and against the late appearance of toxic symptoms.

The author used Mapha-Vermexan, an isomeric mixture containing 12 to 15 per cent. of the gamma isomer of BHC, used not as an emulsion but as a dry substance. He treated 65 persons, of whom 48 of different ages had active enterobiasis, and, as Graeve and Herrnring [this *Bulletin*, 1950, v. 47, 391] have also reported, no toxic effects occurred. In 2 persons only there was, on the 3rd to the 4th day, marked urticaria, which disappeared relatively quickly after treatment with calcium injections and saline purges. In some cases, after treatment began, eosinophilia (up to 17 per cent. in one case) occurred. Yet 6 patients not infected with worms took 2 to 3 times the dose without eosinophilia and, when 3 times the dose was regularly taken for 6 consecutive days no significant blood change was seen during 10 days. Sensitive patients, especially children, may find its mouldy taste and smell unpleasant.

The drug was well tolerated by several guineapigs undergoing a nutritional experiment. Single doses given to rats and guineapigs showed that the toxicity of the drug is relatively slight. Its cumulative toxic action first appeared when the author gave 20 to 25 per cent. of the fatal dose for more

than 6 days or longer, a result which agrees with that of Lendle and Schneider (*loc. cit.*). Toxic effects should hardly be noted in man, because the toxic dose is 1·5 gm. per kgm. bodyweight and for a man weighing 65 kgm. it would be 97·5 gm. The daily human therapeutic dose is only 0·24 gm. and the total dose given over 3 days 1·44 gm.

The author did not usually give more than a total dose of 1·5 gm. He gave 2 dragées, each containing 0·04 gm., 3 or 4 times a day swallowed whole before meals with a little fluid; and, if possible, after each stool, and in all cases after each stool in the morning and evening, one suppository containing 0·05 gm. of Gammexane introduced deep into the rectum. Children under 3 years had 1 dragée 3 to 4 times a day and one suppository in the morning and evening. The dosage was usually continued for 5 to 6 days. No special diet was ordered, but from the 3rd day to the end of the course a mild purge was thought advisable to reduce possible urticaria. The usual precautions of washing the hands, keeping the finger-nails short, etc., were ordered and the author thinks that changing the bedclothes is especially necessary and that other persons in the house, or at least those infected, should also be treated.

Of the 48 persons with enterobiasis treated, 45 (90·4 per cent.) were worm-free after one course of treatment. But in most patients worm eggs again appeared for a long time. Of 37 patients followed up 32 (86·5 per cent.) were still egg-free after 3 to 4 months. In the other 5, who were egg-free after treatment, eggs were again found, but these 5 no longer had active enterobiasis. Large and old female *Enterobius* appeared in the stools, especially between the 2nd and 4th days of the treatment, but these worms were not motile in water at 30°–40°C. Often partly digested worms were seen, but smaller worms were practically absent from the stools. When 8 patients infected with *Taenia saginata* were given 3 times the dose, the tapeworms were not expelled, although *filix mas* expelled the worms from all but one of these. Three times the dose had no effect on *Ascaris* in 2 patients.

The author concludes that Mapha-Vermexan is a very useful and effective drug for enterobiasis, as Brede (*loc. cit.*) and Klosa [this *Bulletin*, 1951, v. 48, 62] have also found with other Gammexane preparations. The combination of tablets and suppositories seems to be essential, especially as a prophylactic against reinfection. Apart from its mouldy taste and smell the drug seems, if the correct doses are given, to be outstanding for its compatibility and relative non-toxicity to man. *G. Lapage*

Wu, Liang-yu. **Studies on *Trichinella spiralis*. I. Male and Female Reproductive Systems.** *J. Parasitology.* 1955, Feb., v. 41, No. 1, 40–47, 12 figs. on 2 pls.

Freeman, Lelabelle C., Brady, F. J., Kessler, Althea D. & Scott, R. B. **Observations on Trichinosis. Report of a Community Outbreak.** *Amer. J. Dis. Children.* 1955, Feb., v. 89, No. 2, 194–8.

"Fourteen cases of trichinosis occurring in four households are reported. The source of the outbreak was ingested pork sausage from garbage-fed hogs. Two patients were hospitalized. Four cases were very mild and two were asymptomatic. The report of the intradermal and precipitin tests are stated. Nausea and vomiting were conspicuously absent in these cases, fever and weakness being the outstanding complaints. Eosinophilia was present in all of the 14 cases.

" The cases in this epidemic demonstrated many of the protean manifestations of this disease and reflected the perplexing nature of the differential diagnosis. The consumption of pork products from hogs fed uncooked garbage represents the chief source of epidemics of this type. Prevention can be accomplished by thoroughly cooking raw garbage before it is fed to swine. As a safeguard against infection in the human, all pork products should be thoroughly cooked."

Segar, L. F., Kashtan, H. A. & Miller, P. B. **Trichinosis with Myocarditis. Report of a Case treated with ACTH.** *New England J. of Med.* 1955, Mar. 10, v. 252, No. 10, 397–8, 2 figs.

" A case of severe trichinosis with myocarditis is presented. ACTH therapy produced clinical improvement and prompt suppression of the myocarditis."

HAEMATOLOGY

Ramamurti, K. **A Note on the Haemoglobin Levels of Normal Indian Students in Rajasthan.** *Indian J. Med. Res.* 1955, Jan., v. 43, No. 1, 57–9.

" 1. A study of the haemoglobin content was made on the blood of 112 normal Indian students in Rajasthan living in hostels.

" 2. Opportunity has been utilized for making a comparative study of some of the more recent methods for the determination of haemoglobin.

" 3. The high haemoglobin values for the Rajasthani students, compared to Western standards, point to the well-balanced character of the diet with respect to iron."

Chaudhuri, S. **Hydrolised Protein and Milk Powder in the Treatment of Anaemia in India.** *J. Trop. Med. & Hyg.* 1955, Mar., v. 58, No. 3, 56–63. [20 refs.]

Sixty patients with severe anaemia were admitted to the Safadr Jang Annexe Hospital in Delhi and after a thorough clinical and haematological examination they were given the hospital diet for a period of 5 days, after which it was supplemented with extra protein from milk powder, milk or protein hydrolysates. The hospital diet itself consisted of 302 gm. of carbohydrate, 17 gm. of fat and 73 gm. of protein which included 16 of animal origin. There was a fair amount of fresh vegetables but very little fruit included in the regimen. The additional protein given varied from 20 to 30 gm. a day except in the case of the protein hydrolysates where the amount was not known.

Although no specific treatment for the anaemias was given, and they were of all types, measurable improvement by diet plus protein alone was seen in the majority of cases, except when a protein food was given which was a predigested concentrate from defatted ground-nut cake and in the case of protein hydrolysates. [Unfortunately it is not stated at what time the patients were investigated after the diet was started. It would be difficult to exclude the effect of specific haematinics present in the food

other than animal protein if an average rise of haemoglobin from 2 to 5 gm. per cent. were achieved over a period of very many weeks. Nevertheless the paper produces a good case for the importance of including an adequate supply of essential amino-acids in the diet in the treatment of anaemia.]

H. Lehmann

Tasker, P. W. G. **Studies in the Nutritional Anaemias of Malaya. Diagnosis.** *Med. J. Malaya.* 1954, Dec., v. 9, No. 2, 152–60, 4 figs. [26 refs.]

The author surveys the means by which it is decided whether a nutritional anaemia seen in Malaya is caused by iron deficiency or by a deficiency of liver factors such as folic acid or vitamin B12. Both conditions are unrelated to each other except that they are often both nutritional in origin and when combined in an individual the combination has been referred to as dimorphic anaemia. The author does not believe that in the conditions prevailing in Malaya a clear assessment of the presence or absence of megaloblastic erythropoiesis can be made by the study of the peripheral blood alone. If, for instance, the presence of red cells as ring forms is taken to indicate the need for iron, and the presence of well haemoglobinized macrocytes is assumed to indicate the presence of a megaloblastic marrow, then wrong diagnoses were made in 32 of 50 patients with normoblastic erythropoiesis, in 6 of 21 with megaloblastic and 19 of 29 with intermediate megaloblastic bone-marrow. Similar results were seen when the absolute indices were taken as guide. When an MCV of greater than 96 cu.μ was taken to indicate a megaloblastic marrow and an MCHC of less than 24 per cent. coupled with an MCV of 75 cu.μ to indicate the certain absence of megaloblastic erythropoiesis and when these absolute indices and the appearances of the slide were combined as a means of diagnosis, the errors still amounted to 21 per cent. The absolute lymphocyte count is also of little help except perhaps that a count of over 2,000 per cmm. virtually excludes a megaloblastic marrow. Histamine-fast achlorhydria occurs frequently in both groups of anaemia, and liver disease is so frequent that a raised serum bilirubin cannot be accepted as a valuable diagnostic sign of megaloblastic anaemia.

The author concludes that the inspection of the bone-marrow is indispensable for the diagnosis of megaloblastic anaemia in Malaya.

[The article, although well produced and illustrated, is marred by an unusually large number of misprints, particularly in the references. Certainly in Fig. 1 to mix up MCV and MCHC in abscissa and ordinate suggests that there cannot have been adequate proof reading.]

H. Lehmann

Matoth, Y., Shamir, Z. & Freundlich, E. **Thalassemia in Jews from Kurdistan.** *Blood.* 1955, Feb., v. 10, No. 2, 176–89, 5 figs. [23 refs.]

"1. Seven cases of Cooley's anemia in Jews from Kurdistan residing in the Jerusalem area are presented with family studies. Four homozygous cases were severe and progressive. One ended fatally and the remaining 3 were kept alive by frequent blood transfusions. Three heterozygous cases showed a milder course.

"2. It is suggested on the basis of these and other observations that the Jews of Kurdistan constitute a hitherto unknown reservoir of the genetic abnormality responsible for Cooley's anemia."

Ganguli, H. & Lahiri, S. C. **Observations on Cooley's Anaemia.** *J. Indian Med. Ass.* 1955, Mar. 16, v. 24, No. 12, 453–7, 1 fig. [23 refs.]

"1. Eleven cases of Cooley's anaemia amongst Indians have been presented and discussed.

"2. The sex incidence is predominantly male in our series in contrast with the previous view of equal sex incidence.

"3. The few cases where W.B.C. count was comparatively low (below 10,000) were almost all over 10 years of age.

"4. Characteristic bony changes had occurred in the long bones, without coexisting skull changes, in 4 cases. The reverse was not seen."

Lie-Injo Luan Eng & Jo Kian Tjay. **Cooley's Anaemia in Children in Indonesia.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, Mar., v. 7, No. 1, 30–42, 8 figs. [20 refs.]

Three children with thalassaemia major were discovered in Indonesia and the differential diagnosis from hookworm anaemia is discussed. The osmotic resistance to low saline concentrations was increased and foetal haemoglobin was very much increased in all three patients; in one it was 90 per cent. All the children were more than two years old and the authors state that ordinarily no alkali-resistant haemoglobin was found in children above that age in their laboratory. One of the children was Indo-European, the other two were pure Indonesians. *H. Lehmann*

Bartlett, G. R., Hughes, Lenore, Barney, Carolyn & Marlow, A. A. **Erythrocyte Metabolism in Sickle Cell Anemia.** *Proc. Soc. Exper. Biol. & Med.* 1955, Feb., v. 88, No. 2, 288–9. [11 refs.]

"Several tests of carbohydrate metabolism in the sickle cell anemia erythrocyte did not disclose any abnormality."

See also p. 605, Archibald & Bruce-Chwatt, **Sickling and Malaria.**

Vernier, R. L. **Hematuria as Manifestation of Sickle-Cell Anemia in Children.** *Amer. J. Dis. Children.* 1955, Feb., v. 89, No. 2, 221–5. [14 refs.]

Although much has been written on the changes in the cardiovascular system in sickle-cell anaemia there have been very few reports of its renal manifestations and, as the author points out, none of the current textbooks of haematology and urology mention sickle-cell anaemia as a cause of renal disorder. The present article describes an attack of haematuria in a 5-year-old Negro child suffering from pains in the region of the right kidney. Intravenous pyelograms demonstrated slight dilatation of the right kidney calyces and pelvis. The child was given a blood transfusion and within a few weeks was discharged in good physical condition. The haemoglobin level was 8·7 gm. per cent. Two years later there was still anaemia but the urine was normal. The diagnosis of sickle-cell anaemia is based on the fact that a sickle-cell preparation showed 10 per cent. sickling in 30 minutes when incubated with 2 per cent. sodium bisulphite. The X-ray film of the abdomen demonstrated coarsening of the trabecular pattern of both iliac bones and a slight sclerosis of bones of the ribs. However, the X-ray studies of the bones of the skull and extremities were considered normal. The

alkali-resistant haemoglobin fraction was 8·34 per cent. The father had died; the mother was available for examination and showed no sickle cells and her alkali-resistant haemoglobin fraction was 2 per cent. [From the above data it does not seem likely that the patient was a sickle-cell homozygote, and in the absence of electrophoretic analysis one can only assume that the patient was either a sickle-cell-trait carrier, or a person with sickle-cell-haemoglobin-C disease, or, in view of the small amount of foetal haemoglobin found in the mother's blood, which is just above the accepted limit of technical error, the child may have suffered from sickle-cell-thalassaemia disease. It is actually not important whether the patient was a homozygote or not because most of the reports on haematuria in persons with sickle-cell gene concerned sickle-cell-trait carriers.]

This article is particularly valuable because it gives a survey of the publications on haematuria in persons with the sickling phenomenon and tabulates the individual data. Excluding the author's case, 29 have been described in the literature and 21 were believed to have had the trait without the anaemia, 5 had clinical sickle-cell anaemia and in 3 the sickling phenomenon was demonstrated in organs studied after operation or autopsy only. All these patients had been studied extensively in an attempt to explain the haematuria by some other mechanism but no other explanation could be found, even in 8 patients in whom nephrectomy was performed. There have also been mentioned in the literature, details of which are lacking, 5 more patients who all had unilateral haematuria and positive sickle-cell tests. All were treated symptomatically and recovered. [There must be many more such cases. The writer of this abstract has seen and heard of at least 20 unpublished examples observed in highly reputable North American hospitals, in whom tuberculous lesions had been excluded and haematuria was ascribed to the sickling phenomenon. Nearly all of these were sickle-cell-trait carriers.] Some authors believe that a capillary defect is the major cause of haematuria, others suggest that sickled red blood cells cause thromboses in the renal vessels. However, both explanations may be correct because in the event of stasis and tissue anoxia the vessel wall might be altered functionally and its permeability increased to such an extent that cellular elements of the blood could pass into the parenchymal tissues and, in the kidney, this would result in haematuria. The fact that the renal haemorrhage has been unilateral in every instance and restricted to the left kidney in the majority of cases is difficult to explain. It is worth mentioning here the paper by Kunz, Pratt, Mellin and Cheung (*Pediatrics*, 1954, v. 13, 352) in which renal function was shown to be impaired in sickle-cell anaemia. *H. Lehmann*

Hartz, W. H., Jr. & Schwartz, S. O. **Hemoglobin C Disease. Report of Four Cases.** *Blood.* 1955, Mar., v. 10, No. 3, 235–46, 3 figs. [13 refs.]

"1. The cases of four Negro patients with splenomegaly and targeting of the red cells are reported.

"2. Electrophoretic analysis of the hemoglobin in these cases revealed type C hemoglobin exclusively.

"3. An analysis of the genetic, clinical, and hematologic manifestations was made.

"4. For convenience, the name hemoglobin C disease has been given to the mild hemolytic syndrome observed in these patients.

"5. Electrophoretic recognition of hemoglobin C by filter paper and Tiselius technics is illustrated.

" 6. Differential diagnosis is discussed with special attention directed to the mild form of Mediterranean anemia."

EPIDEMIC DROPSY

Chakravarty, N. K., Chaudhuri, R. N. & Werner, G. **Observations on Vascular Changes produced by Argemone Alkaloids.** *Indian J. Med. Res.* 1955, Jan., v. 43, No. 1, 107–12, 5 figs. on 3 pls. [14 refs.]

" The effect of prolonged administration of argemone alkaloids on blood vessels was studied *in vivo* in the rabbit's ear by means of the Sandison-Clark transparent chamber. The alkaloids stimulated the growth of vessels which formed a dense plexus very prone to haemorrhage. Periodic blanching of large vascular areas with spontaneous constrictions of arterioles occurring in cycles was also observed.

" With these findings it has now become possible to reproduce in rabbits the chief vascular changes characteristic of epidemic dropsy."

VENOMS AND ANTIVENENES

Roze, J. A. Nota preliminar sobre los ofidios de la expedición Franco-Venezolana al Alto Orinoco. [**Preliminary Note on Snakes collected by the Franco-Venezuelan Expedition to the Upper Orinoco**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1954, Mar., v. 2, No. 2, 227–34, 4 figs.

The English summary appended to the paper is as follows:—

" Three new records of poisonous snakes are mentioned for Venezuela, all of them collected by the members of the Expedición Franco-Venezolana to the upper Orinoco, Territorio Federal Amazonas, Venezuela. The species are *Micrurus hemprichi hemprichi* (Jan), 1858, *Micrurus spixi obscurus* Schmidt, 1953 and *Bothrops neglecta* Amaral, 1923. The author does not agree with the change of the type locality for *M. hemprichi hemprichi*, proposed by Schmidt, since the new Venezuelan locality of the specimen, described in this contribution, invalidates Schmidt's supposition, that this subspecies does not occur in Colombia nor Venezuela, but agrees with the change of type locality for *M. spixi spixi* (Schmidt). It is supposed that the typical subspecies, *M. spixi spixi* does not occur in Venezuela, although reported several times for this country; all these records have been taken from Boulenger who, unfortunately, confused *M. spixi* with *M. isozonus* (Cope), a species widely known in Venezuela."

Vicente Scorza, J. Contribución al estudio de los escorpiones venezolanos. Clave para la identificación de especies y consideraciones generales sobre los escorpiones domiciliarios. [**Key to the Identification of Species of Scorpions in Venezuela and General Observations on Domestic Species**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1954, Mar., v. 2, No. 2, 157–65, 2 figs.

The English summary appended to the paper is as follows:—

" In this report the author makes general considerations about the history of the knowledge of scorpions in Venezuela, giving a key for 33 species

located in the country and naming the species that up till now have been in houses and others which are becoming house-species."

Bettini, S. & Cantore, G. Sull'azione protettiva dell'ACTH, del cortisone, del gluconato di calcio, della pirilamina (Neoantergan), della prometiazina (Fargan), della cloropromazina (Largactil) nel latrodectismo indotto nella cavia. [**Protective Action of Corticotrophin, Cortisone, Calcium Gluconate, Mepyramine (Neo-Antergan), Promethazine (Fargan) and Chlorpromazine (Largactil) in** *Latrodectus* **Poisoning experimentally produced in Guineapigs**] *Riv. di Parassit.* Rome. 1954, Oct., v. 15, No. 4, 259–65. [16 refs.] English summary (6 lines).

The authors have previously reported favourably on the use of calcium gluconate in the treatment of *Latrodectus* bites [this *Bulletin*, 1953, v. 50, 850].

They now record experimental work in which guineapigs were inoculated with *Latrodectus tredecim-guttatus* venom in quantities of 0·2 mgm./kgm. and treated with the substances quoted in the title. The dose of corticotrophin used was 15 mgm./kgm.; of calcium gluconate (10 or 20 per cent.) 9 cc./kgm.; and of cortisone, mepyramine, promethazine and chlorpromazine, 20 mgm./kgm. in each case. The drugs were given subcutaneously, except in the case of calcium gluconate which was given either intraperitoneally, or intraperitoneally plus subcutaneously in rotation.

The results are shown in tables, which indicate that all the drugs used gave some protection; about one-third of the animals were protected in each case. These results are discussed in relation to the treatment of *Latrodectus* bites in man. *H. J. O'D. Burke-Gaffney*

Tange, Y. Beitrag zur Kenntnis der Morphologie des Giftapparates bei den japanischen Fischen, nebst Bemerkungen über dessen Giftigkeit. VIII. Über den Giftapparat bei *Scorpaenodes littoralis* (Tanaka). [**Studies on Morphology of Japanese Fish with Observations on Toxicity. VIII. Poison Apparatus of** *Scorpaenodes littoralis*] *Yokohama Med. Bull.* 1954, Oct., v. 5, No. 5, 383–8, 4 figs.

TOXOPLASMOSIS

Jírovec, O. & Jíra, J. Pokus o výklad epidemiologie a pathogenese toxoplasmosy. [**Experimental Studies on the Epidemiology and Pathogenesis of Toxoplasmosis**] *Časopis Lékařů Českých.* Prague. 1955, Feb. 25, v. 94, No. 9, 213–23, 1 chart.

Ruge, H. Neuere Ergebnisse auf dem Gebiet der Toxoplasmoseforschung. [**Recent Achievements in Toxoplasmosis Research**] Reprinted from *Medizinische.* Stuttgart. 1954, Mar. 13 & 20, Nos. 11 & 12, 20 pp. [Numerous refs.]

This is a condensed but complete and up-to-date review of our present knowledge of toxoplasmosis. It enables the busy reader to assess at a glance

the achievements made by recent investigations on various aspects of this disease in man and animals, while those seeking detailed information will find all they want in the numerous references. *C. A. Hoare*

Holz, J. Über *Toxoplasma gondii* und seine Affinität zu den Geweben des Wirtes. [*Toxoplasma gondii* **and its Relation to the Host's Tissues**] *Acta Tropica.* Basle. 1954, v. 11, No. 4, 354–78, 17 figs. & 4 charts. [45 refs.]

The stated object of the study described in this paper was the occurrence of *Toxoplasma gondii* in its host's tissues, especially in the blood, and its bearing on the diagnosis of the infection by examination of blood films.

In the first part, a critical review is given of our knowledge of toxoplasmosis. In describing the parasite attention is drawn to the presence in the cytoplasm of granules of ribonucleic acid and phosphates, as well as to a system of longitudinal fibrils covering the surface of the body, all of which are revealed by electron microscopy. In the author's opinion, the fibrils represent organs of locomotion, comparable to myonemes. Finally, the clinical and pathological aspects of this disease are discussed.

In the second part, an account is given of the author's observations in experimental toxoplasmosis in mice, the object of which was to determine the course of infection, and the study of various stages appearing in blood films. For this purpose 3 batches, each of 70 mice, were inoculated intravenously, subcutaneously and intraperitoneally respectively, with 0·25 cc. of toxoplasm-suspension containing about 25 parasites per microscopic field. This study was supplemented by data obtained from observations on 2,000 mice, which had been used for Sabin-Feldman's dye test, as well as by studies of tissue cultures.

It was found that after subcutaneous inoculation parasites appeared in the blood within 80 hours, after intraperitoneal inoculation within 95 hours, and after intravenous inoculation within 24 hours. Whichever route was used, the parasites always appeared in the peritoneal exudate, where different forms were found free or within macrophages and plasma cells. Various stages of the parasite, including forms dividing by binary fission, occurred in the peripheral blood of infected mice. Among the organs, the following were parasitized: spleen, liver, brain, intestine and lungs, but multiplication was confined chiefly to the brain and lungs.

Since the parasites can be readily detected in the circulation, the examination of blood films affords a reliable method for the diagnosis of the infection, in contrast to the dye test, the results of which are unpredictable.

C. A. Hoare

Jettmar, H. M. Über Schädigungen der Toxoplasmen durch verschiedene Körperflüssigkeiten des Menschen und der Tiere. [**Deleterious Effects on Toxoplasms of Different Body Fluids of Man and Animals**] *Arch. f. Hyg. u. Bakt.* 1955, Mar., v. 139, No. 1, 33–41, 2 figs. [14 refs.]

Harboe, A. & Erichsen, S. **Toxoplasmosis in Chickens. 3. Attempts to provoke a Systemic Disease in Chickens by Infection with a Chicken Strain and a Human Strain of** *Toxoplasma. Acta Path. et Microb. Scandinavica.* 1954, v. 35, No. 5, 495–502. [18 refs.]

An epidemic of toxoplasmosis occurred in chickens in south-eastern Norway; a strain of *Toxoplasma* was isolated, and its behaviour was studied

in artificially inoculated chickens (White Leghorns and other breeds). Comparative studies were made with the RH (human) strain of parasite. Chickens 12–16 weeks old developed intense skin reactions after intracutaneous inoculation with either strain; but the infection did not become disseminated and no organisms were recovered. Day-old chicks were inoculated subcutaneously and 2 out of 10 of those which had received the avian strain showed an intense pneumonia accompanied by numerous parasites. A chicken, 16 weeks old, was inoculated intracerebrally with the human strain, and 5 days later it was found dead, with meningitis and perivascular cuffing accompanied by abundant organisms. In all the other experiments. with intravenous, intratracheal or other methods of inoculation, employing tissue suspensions, mouse peritoneal exudate or egg culture material, and even utilizing chickens weakened by disease or by administration of cortisone, no systemic infection (such as occurred in the original outbreak) was ever produced, nor in fact was the organism recovered except in the 3 instances noted above. Quite a number of the chickens died, and some showed lesions possibly due to toxoplasmosis, but their aetiology remained doubtful. The authors therefore assume that some factor must have been missing in their laboratory experiments which was operating during the epidemic. *P. C. C. Garnham*

Dymowska, Zofia, Kozłowska, Danuta & Włodek, Zofia. Próby zakażenia toksoplazmą białych szczurów oraz poszukiwanie toksoplazmy u dzikich szczurów. [**Experimental** *Toxoplasma* **Infection of White Rats and Attempts to find** *Toxoplasma* **Infection among Wild Rats**] *Med. Dośw. i Mikrob.* Warsaw. 1955, v. 7, No. 1, 71–5. [14 refs.]

The English summary appended to the paper is as follows:—

"40 white rats were inoculated orally and intraperitoneally with suspension of organs of mice previously infected with a toxoplasma strain. The Sabin-Feldman dye-test, complement fixation reaction, and microscopical examination of internal organs were all negative. Toxoplasma strains could not be obtained by repeated passages of a suspension of infected rat organs on mice. White rats have been found unsuitable for toxoplasma cultivation.

"150 wild rats were studied serologically and microscopically as to the presence of toxoplasma infection. The results were all negative. Probably wild rats in Warsaw do not constitute a toxoplasma reservoir."

DERMATOLOGY AND FUNGUS DISEASES

de Almeida, M. A. Estudo funcional da córtex suprarenal no pênfigo foliáceo pela prova do ACTH em quatro horas. [**Study of the Activity of the Suprarenal Cortex in Pemphigus Foliaceus by Means of the Four-Hour Test with Corticotrophin**] *Arquivos de Dermat. e Sifiligrafia de São Paulo.* 1954, Jan.–June, v. 16, Nos. 1/2, 3–14. [15 refs.]

The following is a translation of the author's summary:—

The author studied the activity of the suprarenal cortex in 25 patients with pemphigus foliaceus by means of the Thorn test (reaction to corticotrophin in 4 hours).

It is concluded that cortico-suprarenal insufficiency was present in 64 per cent. of the cases studied.

From statistical analysis of the results the author concludes that the cortico-suprarenal insufficiency in pemphigus foliaceus is transitory and does not depend on the duration of the disease or the rapidity with which the bullous lesions become generalized in the beginning of the condition, but is more pronounced when the final development of bullae is recent.

H. J. O'D. Burke-Gaffney

Jacobson, F. W., Clearkin, K. P. & Annamunthodo, H. **Chromomycosis. Report of Four More Cases in Jamaica.** *West Indian Med. J.* 1954, Sept., v. 3, No. 3, 153–8, 8 figs. on 4 pls. [14 refs.]

Montemayor, L. *Blastomyces dermatitidis*-Gilchrist & Stokes 1898 en Venezuela. Nota previa. [*Blastomyces dermatitidis*, **in Venezuela; Preliminary report**] *Gac. Méd. de Caracas.* 1954, Nov.–Dec., v. 62, Nos. 11/12, 675–89, 13 figs. [28 refs.]

The author's report of a case of blastomycosis of the North American type (*Blastomyces dermatitidis*), proved by histopathological study and by identification of the causative fungus in culture, is of particular interest as the first recorded instance of the disease in Venezuela and, indeed, the first well authenticated case in South America. The patient lived in Valencia and, presumably, the infection is regarded as autochthonous. The characters of the fungus as seen in the tissues and in culture are described.

Mackinnon and Vinelli [this *Bulletin*, 1950, v. 47, 882] pointed out that earlier reports of the occurrence of the North American type of blastomycosis in South America had in no instance been confirmed by isolation and identification of the causative fungus in culture, and their observations on the thickness of the cell membrane of the parasite seen in the lesions indicated that the fungus in such cases was the South American species *Paracoccidioides brasiliensis* and the disease South American blastomycosis or Lutz's disease.

J. T. Duncan

Breslau, A. M. **Comparative Histochemical Studies on** *Coccidioides immitis* **and** *Haplosporangium parvum*. *J. Histochem. & Cytochem.* Baltimore. 1955, Mar., v. 3, No. 2, 141–7, 12 figs. [22 refs.]

Cohen, R. **Two New Coccidioidal Fungicides. 1. Oil of Sassafras. 2. Sodium Salt of Cinnamic Acid.** *Arizona Med.* 1955, Mar., v. 12, No. 3, 106.

"Two new fungicides for coccidioides immitis are reported. Oil of sassafras completely inhibits this fungus at 500 micrograms per milliliter. The sodium salt of cinnamic acid completely inhibits coccidioides at 30 micrograms per milliliter."

[A report on clinical evaluation is promised.]

Pace, J. M. **Coccidioidomycosis of the Epididymis.** *Southern Med. J.* 1955, Mar., v. 48, No. 3, 259–60, 1 fig.

"Coccidioidomycosis is primarily a disease of the lungs but may occasionally involve distant organs as does tuberculosis. The physical

characteristics of the involved epididymis are quite similar to a tuberculous infection and similar surgical treatment is suggested and was successfully employed in this case."

KEMENES, F. Über einen Fall von Coccidioidomykose bei einem Kaninchen in Ungarn. [**A Case of Coccidioidomycosis in a Rabbit in Hungary**] *Acta Microbiologica.* Budapest. 1954, v. 2, Nos. 1/2, 191–4, 4 figs.

BURGER, C. H. & LEVAN, N. E. **Coccidioidomycosis in the Dog. Report of Three Clinical Cases.** *J. Amer. Vet. Med. Ass.* 1955, Apr., v. 126, No. 937, 297–301, 6 figs.

TROPICAL OPHTHALMOLOGY

REINHARDS, J. Quelques chiffres au sujet de la guérison spontanée du trachome. [**Statistics relating to Spontaneous Cure of Trachoma**] *Maroc Méd.* 1954, May, v. 33, No. 348, 466–8, 1 chart.

The following is a translation of the author's summary:—

A curve is presented showing spontaneous cure [of trachoma] in South Morocco.

Among 8,474 Moslems 26·5 per cent. of adults were cured of their trachoma in the absence of treatment.

Towards the south of the area the index of cure reached 50 to 60 per cent.

Climatic, racial and familial hygiene factors are considered to play an important rôle.

Further studies will be pursued on a larger scale with a view to obtaining fuller information on the problem of spontaneous cure.

H. J. O'D. Burke-Gaffney

JEBEJIAN, R., in collaboration with R. NACCACHE, R. DJASSEM & L. ASMAR. Enquête sur la guérison spontanée du trachome. [**Studies on the Spontaneous Cure of Trachoma**] *Rev. Internat. du Trachome.* 1955, v. 32, No. 1, 1–86, 2 figs., 3 graphs & 4 charts. [78 refs.]

See also p. 651, KIRWAN, **Ocular Leprosy.**

See also p. 651, CHOYCE, **Ocular Leprosy, with reference to certain Cases shown.**

See also p. 642, FALCONE, Il cloroamfenicolo nella terapia delle complicazioni oculari della febbre ricorrente da zecca. [**Chloramphenicol in the Treatment of the Eye Complications of Tick Relapsing Fever**]

HEAT STROKE AND ALLIED CONDITIONS

THOMSON, M. L. **Relative Efficiency of Pigment and Horny Layer Thickness in protecting the Skin of Europeans and Africans against Solar Ultraviolet Radiation.** *J. Physiology.* 1955, Feb. 28, v. 127, No. 2, 236–46, 3 figs. [23 refs.]

In white-skinned races thickening of the stratum corneum has been shown to be of more importance than pigmentation in protecting against ultraviolet rays.

In the present investigation horny layer was obtained from Europeans and Africans by blistering with cantharides and removing the cellular layers with a fine camel-hair brush. The site chosen was one inch behind the greater trochanter, an area which is normally unexposed to friction or ultraviolet light. Thickness of the layer was measured by cutting the specimens at right angles to the surface and ascertaining the width directly at 0·2 mm. intervals, with oblique illumination and linear eyepiece micrometer. The estimated accuracy was $\pm 7\frac{1}{2}$ per cent. Transmission of ultraviolet radiation was measured by mounting moist specimens against selochrome photographic plates so that specimens were in close contact with the plates which were then exposed to filtered ultraviolet light from a Kromayer quartz mercury vapour lamp. After developing the plates, the densities beneath and around specimens were ascertained by photometers of photo-electric and integrating sphere types.

The mean thickness of the stratum corneum was found to be 9·5 μ in Europeans and 11·1 μ in Africans, a difference which is not statistically significant.

The inherent transmission of solar ultraviolet radiation (3,000–4,000 Å.) by the photographic method was on the average more than 3 times as great in Europeans as in Africans. The greater opacity of this layer in Africans was moreover confirmed by exposing living skin to natural sunlight through specimens of stratum corneum from both races; the resulting erythema was stronger under European specimens. A highly significant correlation was found between transmission of solar ultraviolet light and horny layer thickness in Africans. Nevertheless, regression of transmission on horny layer thickness confirmed that some factor or factors other than the thickness of this layer must account for the differences in transmission between Africans and Europeans. Evidence that skin pigment was mainly responsible for the racial difference was provided by skin reflectance measurements, and by an albino African whose transmission lay in the European group.

H. T. H. Wilson

MISCELLANEOUS DISEASES

EDINGTON, G. M. **Cardiovascular Disease as a Cause of Death in the Gold Coast African.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, Sept., v. 48, No. 5, 419–25. [17 refs.]

In a series of 3,645 autopsies carried out in Accra between 1921 and 1953 it was found that cardiovascular disease was the cause of death in 12·8 per cent. Many of these autopsies had, however, been done at the request of the coroner on persons dying suddenly and it is therefore thought

that this figure is higher than that for the general population of the Gold Coast.

Aneurysm and aortitis accounted for 40·5 per cent. of all types of cardiovascular disease present. In this group the age incidence of the aneurysm and aortitis and the incidence in the two sexes did not differ markedly from those pertaining in Europe. On the evidence available it was concluded that syphilis could not be excluded as the cause of these conditions and that there was no clear evidence to attribute them to yaws.

Cerebral haemorrhage and thrombosis, subarachnoid haemorrhage, hypertension and atheroma accounted for 21·6 per cent. of all cardiovascular disease. Malignant hypertension in young adults, it is stated, is not rare in the Southern Gold Coast.

Pericarditis as a presenting feature at autopsy was found in 13·5 per cent. of cases in the series. Pneumococcal and tuberculous infections were the most common aetiological agents responsible. In 6 instances unclassified purulent pericarditis was associated with hypertension and arteriosclerotic kidneys. No case of rheumatic pericarditis was found.

In 6·4 per cent. of the cases disease of the coronary arteries was considered to be the cause of death. In view of the many autopsies performed on persons dying suddenly the incidence of this type of disease is considered to be low as compared with temperate climates.

Subacute bacterial endocarditis occurred in 2 cases and acute bacterial endocarditis in 6. Syphilitic, tuberculous, gonococcal, Fiedler's and unclassified myocarditis accounted for 12 cases. There were 5 cases of beriberi, 4 of congenital heart disease, 5 of medial necrosis of the aorta, 2 of aortic stenosis, one of sarcoma of the heart, and one of cerebral embolism. Mitral stenosis or rheumatic endocarditis was reported as the cause of death in 6 instances. In 7 further cases the pathological findings were consistent with a diagnosis of subendocardial fibrosis [see this *Bulletin*, 1955, v. 52, 203, 205]. *A. W. Woodruff*

i. McFadzean, J. A. **Tropical Pulmonary Eosinophilia in a West African.** [Memoranda.] *Brit. Med. J.* 1955, Mar. 26, 771–2.

ii. Adams, A. R. D., Seaton, D. R. & Kershaw, W. E. **Tropical Pulmonary Eosinophilia in a West African.** [Correspondence.] *Ibid.* 1955, Apr. 30, 1094.

i. A Nigerian male aged 45 complained of fleeting swellings in the skin on different parts of the body, which had been present for 6 weeks. During the latter half of that period he developed a dry cough, worse on lying down, breathlessness on exertion, and a burning sensation inside the chest. He felt generally unwell, but had no fever.

Physical examination revealed no significant abnormalities, other than medium crepitations at both lung bases, and swellings on the cheek, calf and forearm, which were probably Calabar swellings. There was no anaemia, but there was a leucocytosis of 37,800 per cmm. with 88 per cent. eosinophils. No microfilariae were seen in midday blood films and no helminth ova in the stool. Sputum and X-ray examination were not available.

The patient was given penicillin, but the course could not be completed; he received 300,000 units daily for 3 days. Within a week the leucocytes and eosinophils had fallen to 24,700 per cmm. and 73 per cent. respectively; within 2 months more (without further treatment) they had fallen to 9,400

per cmm. and 60 per cent., and 2 months later the figures were 12,000 per cmm. and 57 per cent. The patient now felt better.

He had attacks of pneumonia in 1943 and 1944, the second during Army service in Burma between 1944–1946. In the latter year he " was given oil of chenopodium for ascariasis ". Later that year he returned to Nigeria and spent an unspecified period in Calabar.

The author considers it likely on clinical and haematological grounds, that this was a case of tropical pulmonary eosinophilia. The possible presence of *Loa loa* infection would hardly produce an eosinophilia as high as 88 per cent. (33,264 per cmm.) [but see below] and there was no evidence of any other helminth infection. Although Hunter reported a case in a European in Nigeria [this *Bulletin*, 1946, v. 43, 861] and Wilson recorded 3 in Africans in East Africa [*ibid.*, 1947, v. 44, 851] the author believes that the present case is the first record of this condition in a West African. He speculates whether the disease was acquired in India some 8 years before or whether it was acquired in Nigeria. He cannot state with any certainty whether there had in fact been any response to penicillin, though there is some suggestion that there was.

[It is unfortunate that 2 of the 4 " outstanding features of the disease " listed by Ball (this *Bulletin*, 1951, v. 48, 583) were not confirmed, namely miliary mottling on chest X-ray and therapeutic response to arsenic.]

ii. In a later number of the same *Journal*, three members of the staff of the Liverpool School of Tropical Medicine point out that eosinophil counts of the order mentioned are not unusual in persons with Calabar swellings due to loiasis: and in their view the patient described above presented the ordinary features of this common West African disease, rather than tropical pulmonary eosinophilia. *H. J. O'D. Burke-Gaffney*

Hassall, C. H., Reyle, K. & Feng, P. **Hypoglycin *A,B*: Biologically Active Polypeptides from *Blighia sapida*.** [Correspondence.] *Nature.* 1954, Feb. 20, v. 173, 356–7.

It has long been thought that the arillus of unripe ackee fruit (*Blighia sapida*) contains a toxic substance responsible for some cases of the vomiting sickness of Jamaica. The authors have now isolated two polypeptides—hypoglycin A and B—from the seed of the fruit. The ripe arillus contains a small amount of hypoglycin A, but the unripe arillus contains more. Both compounds were lethal to kittens and the most striking pharmacological activity was found to be the production of hypoglycaemia, which has already been noted as a striking feature of the human disease. These observation provide further circumstantial evidence in favour of the view long held by Scott [this *Bulletin*, 1915, v. 6, 426; 1916, v. 7, 381; 1917, v. 9, 90] that there is a connexion between this fruit and the vomiting sickness. *Charles Wilcocks*

Dasler, W. **Production of Experimental Lathyrism in the Rat by Two Different Beta-Substituted Ethylamines.** *Proc. Soc. Exper. Biol. & Med.* 1955, Feb., v. 88, No. 2, 196–9, 1 fig.

Daniel, M., Petrů, M. & Seidler, L. Příspěvek k plicním akariasám u člověka. [**Observations on Pulmonary Acariasis in Man**] *Časopis Lékařů Českých.* Prague. 1955, Feb. 25, v. 94, No. 9, 223–7, 1 fig. [24 refs.]

Chambon, L. Résistance du bacille de Whitmore acquise *in vitro* et *in vivo* à l'égard du chloramphénicol, de l'auréomycine et de la terramycine. [**Resistance to Chloramphenicol, Aureomycin and Oxytetracycline acquired by Whitmore's Bacillus** *in vitro* **and** *in vivo*] *Ann. Inst. Pasteur.* 1955, Mar., v. 88, No. 3, 315–24, 4 figs.

The author, who has previously reported the sensitivity of strains of Whitmore's bacillus to chloramphenicol, aureomycin and oxytetracycline [this *Bulletin*, 1954, v. 51, 840], now records the changes in sensitivity of 5 strains to these antibiotics in the course of 20 serial transfers in broth containing concentrations just below the inhibitory level. Passage in chloramphenicol did not increase resistance to that antibiotic, nor to oxytetracycline, and slightly increased sensitivity to aureomycin. Transfers in aureomycin and in oxytetracycline increased resistance to these antibiotics and to one another, but did not affect sensitivity to chloramphenicol. A combination of chloramphenicol with aureomycin, or with oxytetracycline, produced increased resistance to chloramphenicol and usually to both the other antibiotics, and therefore would not appear to be indicated in treatment.

The results of observations in 3 patients with melioidosis partly confirmed the above findings, but there were some discrepancies, such as the acquisition of resistance to chloramphenicol by one strain after treatment with that drug. *J. C. Cruickshank*

PARASITOLOGY: GENERAL

von Brand, T. El estudio de la fisiologia parasitaria y su importancia medica. [**Study of Parasite Physiology and its Medical Importance**] Reprinted from *Rev. Med. Chile.* 1953, July, v. 81, No. 7, 413–21. [57 refs.]

A general review.

Ann. New York Acad. Sci. 1953, Oct. 14, v. 56, Art. 5, 815–1093. **Growth of Protozoa.**

This is a symposium of papers presented at a conference on growth of protozoa held by the Section of Biology of the New York Academy of Sciences. In an introductory article, R. P. Hall points out that present knowledge of the growth requirements of protozoa has progressed largely as the result of recent advances in protozoological methods, the most important of which were (a) the development of media for the cultivation of protozoa in the absence of concomitant micro-organisms, and (b) the introduction into these media of measured amounts of synthetic constituents. Of the 35 papers, 21 deal with free-living protozoa, while 14, devoted to parasitic forms, are directly or indirectly of interest to medical workers. J. Cowperthwaite, M. M. Weber, L. Packer and S. H. Hutner describe the nutrition of the mosquito flagellate, *Herpetomonas culicidarum*. The enzyme systems of *Trypanosoma cruzi* are dealt with by H. D. Baernstein, while T. von Brand gives an account of the physiology of the Haemoflagellates in general. The paper by D. Weinman, on the cultivation of *T.*

gambiense and *T. rhodesiense*, is of particular interest, in that it provides evidence of the development of metacyclic trypanosomes in culture. Growth problems in *Trichomonas vaginalis* form the subject-matter of two papers: by H. Sprince, R. Goldberg, G. Kucker and R. S. Lowy; and A. B. Kupferberg, H. O. Singher, G. Lampson, L. Levy and A. H. Romano. Papers on the cultivation of *Entamoeba histolytica* are contributed by 3 groups of authors: B. P. Phillips; J. G. Shaffer; Q. M. Geiman and C. E. Becker, while L. Jacobs describes growth of *Dientamoeba*, and the problem of cultivation of amoebae in general is discussed by C. W. Rees. L. A. Stauber provides a paper on host-parasite relations in hamster leishmaniasis, and finally two papers, by R. B. McGhee and W. Trager, deal with the growth of avian *Plasmodium* in erythrocytes and in culture respectively. *C. A. Hoare*

Silva-Inzunza, Edna, Coutts, W. E. & Coutts, W. R. **Spirochaetoidea and Protozoa Pathogenous for Man as seen in Fixed Unstained Smears under Dark-Field Illumination or the Phase Contrast Microscope.** *J. Trop. Med. & Hyg.* 1954, Dec., v. 57, No. 12, 292–4, 1 fig.

The essential part of this note is the description of a method for preserving spirochaetes and protozoa in unstained smears, for examination and diagnosis at any time, under dark-field illumination or by phase contrast microscopy. For this purpose, " a thin smear of suspected material, before complete drying at room temperature, is covered with a 10 per cent formol solution or with Bouin's fluid for ten minutes, washed softly under tap water and dried between filter paper ".

The remaining part contains an elementary outline of the characteristics of spirochaetes and protozoa [which conveys nothing new to the reader familiar with these organisms, and cannot enlighten the novice].

The appearance of various protista, as seen in the preparations in question, is depicted in a number of photomicrographs. *C. A. Hoare*

Jírovec, O. Neues ueber die durch *Pneumocystis carinii* verursachten interstitiellen Pneumonien der Säuglinge. [**Observations on Interstitial Pneumonia of Infants caused by** *Pneumocystis carinii*] *Riv. di Parassit.* Rome. 1954, Oct., v. 15, No. 4, 473–80, 2 figs. [28 refs.]

The English summary appended to the paper is as follows:—

" The interstitial plasmacellular pneumonia of infants caused by the parasite *Pneumocystis carinii* has become one of the most serious medical problems in the whole of Europe. The statistics for Czechoslovakia give more than 300 mortal cases during the last 3 years, the majority of them in the age of 2–4 months. The infection spreads apparently by aerogen route; the parasites in great masses fill the alveoles and this causes the suffocation of the child. The first infected child becomes a most dangerous source of further infection by other infants aged between 1–4th month, especially in Children's Wards. In our experience latent infected adults may occasionally carry over the infection to infants belonging to the infective age. The mortality rate is stated to be between 10–60%. An effective therapeutic measure has not yet been found. The pneumocystis infection was found also in the lungs of some adults whose organism was weakened by some other illness."

Dutt, A. R. & Ghosh, A. C. **Incidence of Protozoal and Helminthic Infections of the Intestine.** *J. Indian Med. Ass.* 1955, Mar. 16, v. 24, No. 12, 460–61, 2 figs.

The chief value of this work lies in the fact that it represents 6 years' study of no less than 10,979 specimens of faeces taken at random from patients and staff in a tuberculosis hospital in West Bengal. In each case, one saline and one iodine smear was examined; 80 per cent. of specimens were from males.

The results are shown in a table and 2 figures. Protozoa were present in 21·6 per cent. and helminths in 4·5; often both infections were combined. *E. histolytica* occurred in 11·3 per cent., and *Giardia* in 7·5 per cent. Ascaris was found in 2·9 per cent. and other helminths in less than 1 per cent. The results are compared with those found in surveys by other workers in Asia. *H. J. O'D. Burke-Gaffney*

Young, M. M. **Report of a Survey for Intestinal Parasites in School Children in a Rural Mountain County in Tennessee.** *Southern Med. J.* 1955, Jan., v. 48, No. 1, 46–53. [14 refs.]

A high incidence of intestinal parasitism was found in this survey of schoolchildren in Cumberland County, Tennessee. Single specimens of stool from 2,908 children were examined for ova by brine flotation, and for protozoa by direct smear stained with Lugol's iodine, by zinc sulphate flotation and by staining. The results were as follows: incidence of infection 33·2 per cent.; *Necator americanus*, 19·6 per cent.; *Ascaris lumbricoides*, 6·1 per cent.; *Trichuris trichiura* and *Hymenolepis nana*, 1·4 per cent.; *Enterobius vermicularis*, 1 per cent.; *Strongyloides stercoralis*, 0·08 per cent.; *Entamoeba histolytica*, 3·06 per cent.; *Giardia intestinalis*, 9·6 per cent.; mixed infections, 4·9 per cent. A hookworm survey carried out in 1912 had recorded an incidence of 45·8 per cent. and a survey in 1929–31 on 1,201 persons yielded an infection rate of 21·4 per cent. The latter survey also reported an *Ascaris* incidence of 31·3 per cent.; *T. trichiura* in 4·2 per cent. and *H. nana* in 3·9 per cent. *N. americanus* does not appear to have decreased in incidence in 20 years while ascariasis has. This impression may be incorrect and may be due to the substitution of brine flotation for the Stoll quantitative method of stool examination used in 1921–31, because the former technique would tend to reveal more light hookworm infections and would fail to detect infertile *Ascaris* ova.

A correlation between poverty and hookworm infection was noted, poor farming land being the cause of poverty which resulted in inadequate sanitary facilities. It was noted that 13·3 per cent. of those infected had no latrine facilities in their houses and 3 of the schools had had none for at least a year. High-school students who wore shoes and had better habits of personal hygiene showed a much lower incidence (14 per cent.) of intestinal parasites. In a large school in a resettlement area, where settlers had been obliged to build a sanitary privy before anything else, there were practically no cases of hookworm infection. Treatment of the children infected with *N. americanus* resulted in cure in 50·5 per cent.

The incidence of *E. histolytica* infection would probably have been found to be very much greater if the stool examinations had been repeated. Symptoms were noted in 55·2 per cent. of those infected with *G. intestinalis*, which were attributed to the infection. The author believes that chronic infections with *E. histolytica* and *G. intestinalis* are commonly associated with certain vague abdominal disturbances which he lists. He

also noted that practically all those with amoebiasis were using or had used unprotected springs as a source of water and he suggests that this may be related to the incidence of the infection in his survey. *T. H. Davey*

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

Raffaele, G. Su *Anopheles hispaniola* e specie affini del gruppo *Paramyzomyia*. [*Anopheles hispaniola* [*turkhudi*] **and Related Species of the Paramyzomyia Group**] *Riv. di Parassit.* Rome. 1954, Oct., v. 15, No. 4, 601–4. English summary.

Bonne-Wepster, J. **Synopsis of a Hundred Common Non-Anopheline Mosquitoes of the Greater and Lesser Sundas, the Moluccas and New Guinea.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1954, Mar., June, Sept. & Dec., v. 6, Nos. 1, 2, 3 & 4, 1–29; 162–90; 208–46; 347–94; 90 figs. [Numerous refs.]

This series of four papers on culicine mosquitoes should be invaluable to those concerned with the identification of species in this large group in Far East territories. Preliminary sections describe the characters of the adults and larvae used in identification, but resort to male and female genitalia is deliberately avoided. Some notes are given on collecting methods and means of experimentally infecting mosquitoes. The hundred species described include 36 *Aëdes*, 19 *Culex*, 12 *Taeniorhynchus*, 9 *Armigeres*, and 1–5 species each of *Toxorhynchites*, *Tripteroides*, *Topomyia*, *Harpagomyia*, *Hodgesia*, *Uranotaenia*, *Orthopodomyia*, *Ficalbia*, *Aëdomyia* and *Heizmannia*. Under species there is a description of the female, male and larva, well illustrated by frequent line drawings which are commonly of the larva. Bionomics are briefly outlined, relationship to disease recorded, and the known distribution in the islands detailed. *D. S. Bertram*

Vermeil, C. Nouvelle contribution à l'étude du complexe *Culex pipiens* en Tunisie. [**New Observations on the** *Culex pipiens* **Complex in Tunisia**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 6, 841–3.

Paulini, E. & Ricciardi, I. **The Repellent Effect of Pyrethrin Vapour to** *Culex fatigans*. [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1954, May, v. 48, No. 3, 276–7, 3 figs.

An apparatus is described and illustrated with which *Culex fatigans* females were exposed to an air stream of 0·5–1 metre per second bearing the fumes of burning cotton cord impregnated with known percentages by weight of pyrethrum extract. The device was so designed that the mosquitoes could escape from the fumes to a current of normal air. A table

shows results of two experiments with normal cotton cord, and cord impregnated with 0·1, 0·48, 0·97 and 2·0 per cent. of extract by weight. The cords burned at 1 cm. per minute. The numbers of females counted in the normal air stream after 10 minutes' exposure to the fumes were, respectively, 17, 29, 57, 23 and nil. After 3 minutes' exposure the counts were 11, 14, 30, 33 and 34. At the higher concentrations of burning pyrethrum extract "knock down" intervened and repellence could not be evaluated. It is concluded that the fumes were repellent and had this effect up to the intermediate concentration of 0·48 per cent. before "knock down" affected the counts. *D. S. Bertram*

Senevet, G. & Andarelli, L. Le genre *Aedes* en Afrique du Nord. I. Les larves. [**The Genus *Aëdes* in North Africa. I. Larvae**] *Arch. Inst. Pasteur d'Algérie.* 1954, Dec., v. 32, No. 4, 310–51, 16 figs. [33 refs.]

Hamon, J. & Rickenbach, A. Contribution à l'étude des Culicidés d'Afrique occidentale. Description d'*Aedes* (*Aedimorphus*) *mattinglyi* sp. n., *Aedes* (*Banksinella*) *jamoti* sp. n. Notes complémentaires sur *Aedes* (*Aedimorphus*) *stokesi* Evans, *Aedes* (*Banksinella*) *bolensis* Edwards. [**Studies of *Aëdes mattinglyi*, *Aëdes jamoti*, *Aëdes stokesi* and *Aëdes bolensis* in West Africa**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 6, 930–41, 6 figs. [13 refs.]

Chefurka, W. **Oxidative Metabolism of Carbohydrates in Insects. I. Glycolysis in the Housefly** *Musca domestica* **L.** *Enzymologia.* The Hague. 1954, Sept. 15, v. 17, No. 2, 73–89, 11 figs. [62 refs.]

Mitlin, N. & Konecky, M. S. **The Inhibition of Development in the House Fly by Piperonyl Butoxide.** *J. Econom. Entom.* 1955, Feb., v. 48, No. 1, 93–4.

"Piperonyl butoxide inhibits development of the house fly when it is added to CSMA larval medium in concentrations from 0·25 to 0·074 per cent. by weight. The length of larval life is directly proportional to the concentration of the chemical, and the percentage of adult emergence is inversely proportional. Death occurs in the third instar or early during pupation. Both a normal and a DDT-resistant strain of flies are affected similarly, but the effect is greater in the DDT-resistant strain. The addition of fly lipase to the larval medium in concentrations up to 0·75 per cent. does not overcome the action of piperonyl butoxide."

Speroni, G. Impiego di sinergici nella lotta contro la mosca domestica resistente agli insetticidi di contatto. [**The Use of Synergists in the control of *Musca domestica* resistant to Contact Insecticides**] *Chim. e Industr.* Milan. 1952, v. 34, No. 7, 391–403, 8 figs. [59 refs.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1955, Feb., v. 43, Pt. 2, 27–8.]

The author discusses the development of resistance to DDT and other insecticides in house-flies [*Musca domestica* L.] in Italy and elsewhere

and concludes from a comparison of results obtained in various laboratories that resistance to insecticides of the DDT group is distinct from that to insecticides of the chlordane group, with which BHC and toxaphene can be associated. The evidence suggests that strains that have developed resistance to one of these groups normally show only weak resistance to the other, though strains resistant to both can be reared by double selection. It also appears that resistance to DDT results from enzymatic metabolism of the compound to the non-toxic DDE (1,1-bis(p-chlorophenyl)-2,2-dichloroethylene) and consequently that the toxicity of DDT is not due to a metabolite or to the liberation of hydrogen chloride. Resistance to DDT analogues probably results from the same cause, but the mechanism of chlordane-resistance is unknown.

Experiments are recorded in which 115 compounds were tested as synergists with DDT, and many of them with methoxy-DDT also against flies resistant to these insecticides. One of the best was DMC (bis(p-chlorophenyl)-methyl-carbinol), which was highly effective with both insecticides, but several analogues of it were ineffective, including even the ethyl homologue. The reason for this was found to lie in the synergistic action shown by the ethylene derivative of DMC [1,1-bis(p-chlorophenyl) ethylene], which is probably formed competitively in the presence of DDT and inhibits metabolism of the latter. Diphenyl-methyl-carbinol was ineffective, thus demonstrating the importance of the two chlorine atoms, and analogues in which one or both of these were in positions other than the para position were also ineffective.

Diphenylamine was effective with methoxy-DDT but rather less effective with DDT, whereas di(p-chlorophenyl)amine was effective with both, but compounds of this group were not further investigated because of the low persistence of their action and doubts as to their toxicity to warm-blooded animals. Substituted sulphoanilides were also effective or highly effective, the best being N-trichloromethyl-thiol-4-chlorobenzenesulphon-4-chloroanilide, and N-ethyl- or N-methyl-4-chlorobenzenesulphon-4-chloroanilide, which were tested with DDT only, and 4-chlorobenzenesulphon-4-chloroanalide, which was effective with methoxy-DDT also. None of the compounds that acted as synergists for DDT showed any synergism with chlordane or γ BHC.

Perry, A. S., Mattson, A. M. & Buckner, A. J. **The Mechanism of Synergistic Action of DMC with DDT against Resistant House Flies.** *Biol. Bull.* Lancaster, Pa. 1953, v. 104, No. 3, 426–38, 3 graphs. [24 refs.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1955, Feb., v. 43, Pt. 2, 28.]

An account is given of detailed investigations on the effect of DMC (bis(p-chlorophenyl)-methyl-carbinol) as a synergist for DDT against house-flies [*Musca domestica* L.] resistant to the latter and on the relationship between synergistic action and inhibition of the detoxification of DDT by its conversion to DDE (1,1-bis(p-chlorophenyl)-2,2-dichloroethylene) in the flies. The flies belonged to a multiple-resistant strain obtained from a Georgia dairy and designated Roberds. The chemicals were applied topically in benzene solution to females and mortality counts were made after 24 hours. The methods used are described.

The following is largely based on the authors' summary of the results. DMC had no insecticidal properties, but small amounts markedly enhanced the effectiveness of DDT. Thus, the mortality percentages averaged 53 and 95 for applications of 0·65 μg. DDT with 0·65 and 6·5 μg. DMC, 50 and

100 for 6·5 μg. DDT with 0·06 and 0·65 μg. DMC, 15 and 40 for 6·5 and 13 μg. DDT alone and 0 for 6·5 or 13 μg. DMC alone. The log-probit dosage-mortality lines for DDT alone and DDT with DMC showed that, under experimental laboratory conditions, the resistance of the Roberds strain could be reduced by about 98 per cent. on the basis of dosage of DDT applied. Synergistic effect was greatest when the DMC and DDT were applied together. Mortality was markedly lower when either chemical was applied 6 or 24 hours before the other.

It was found that DMC is rapidly metabolised by living flies and is excreted principally as a product tentatively identified as bis(p-chlorophenyl) acetic acid (DDA). It is suggested that 1,1-bis(p-chlorophenyl) ethylene, designated DME for convenience, is an intermediate product in DMC metabolism. In tests in which DME was applied to flies, DDA appeared in the excreta. DME showed some synergistic activity with DDT, but not so much as did DMC. A correlation was found between the extent of synergistic action and the degree of inhibition of DDT-detoxification as estimated from the amounts of DDE recovered from the flies. Mortality was complete when the percentage inhibition was 84·3. Inhibition appears to be of a competitive type, the synergist competing with the insecticide for the mechanism of detoxification.

Metcalf, R. L. & March, R. B. **Further Studies on the Mode of Action of Organic Thionophosphate Insecticides.** *Ann. Entom. Soc. of America.* 1953, v. 46, No. 1, 63–74, 2 graphs. [13 refs.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1955, Feb., v. 43, Pt. 2, 29.]

Though thionophosphate insecticides such as parathion and methyl-parathion do not inhibit cholinesterases *in vitro* to any appreciable extent when highly purified to eliminate S-alkyl isomerides, it can be shown that they kill insects (and mammals) by progressive inhibition of cholinesterase of the central nervous system and they have values for median lethal dosage approximately equivalent to those of the corresponding phosphates. It is therefore evident that they are converted to anticholinesterases, presumably the oxygen analogues, by an enzyme system present in insects and mammals, and the experiments here described show that such a conversion readily occurs in the presence of mammalian and insect tissues under appropriate conditions. Most of the tests were with methyl-parathion, because it was easy to purify and handle, but parathion, isopropyl-parathion (O,O-diisopropyl O-p-nitrophenyl thionophosphate), malathion, O,O-diethyl S-carbamyl-methyl dithiophosphate and EPN (ethyl p-nitrophenyl thiono-benzenephosphonate) were also used. All were highly purified to eliminate traces of the S-alkyl isomerides.

Parathion, methyl-parathion and isopropyl-parathion all produced marked inhibition of the central nervous system of *Musca domestica* L. when topically applied in doses giving about 99 per cent. mortality. The intensity of the cholinesterase inhibition was correlated with the severity of the symptoms, as previously reported for honey bees. The conversion of parathion, methyl-parathion, malathion, EPN and O,O-diethyl S-carbamyl-methyl dithiophosphate to anticholinesterase agents took place *in vitro* under aerobic conditions in the presence of slices of mouse-liver or tissue from *Periplaneta americana* (L.). In tests with methyl-parathion and cockroach gut, the reaction was prevented by heating or homogenising the tissues and by the presence of hydrogen cyanide, sodium azide, sodium selenite, iodoacetic acid, hydroxyl amine or chloropicrin; it was most rapid

between pH 8 and pH 9, and, when various tissues were tested, the highest activity was found in the fore-gut, with less in the Malpighian tubules, mid-gut, nerve cord, hind-gut and fat-body and none in the muscle or cuticle.

The conversion is presumably to the oxygen analogues, as plotting percentage inhibition of fly-brain cholinesterase against solution concentration resulted in parallel curves for the methyl-parathion metabolite and methyl-paraoxon (dimethyl p-nitrophenyl phosphate), and reversed phase paper chromatography of ether extracts of breis of parathion and methyl-parathion with cockroach gut showed the formation of compounds having values equal to those of paraoxon and methyl-paraoxon, respectively.

Mosna, E. & Alessandrini, M. L'impiego degli esteri fosforici nella lotta contro la mosca domestica nella provincia di Latina. [**The Use of the Phosphoric Esters in Control of House-Flies in the Province of Latina**] *Riv. di Parassit.* Rome. 1954, Oct., v. 15, No. 4, 543–56, 2 graphs. English summary.

Floch, H. & Fauran, P. Les vecteurs de la myiase furonculeuse en Guyane française. [**Vectors of Dermal Myiasis in French Guiana**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 5, 652–6. [13 refs.]

Lapierre, J. & Pette, M. A propos d'un cas de myase oculaire dû à *Oestrus ovis* observé dans la région parisienne. [**A Case of Ocular Myiasis due to *Oestrus ovis* seen in the Paris Region**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 4, 561–3, 1 fig. on pl.

The following is a translation of the authors' summary:—

A new case is reported of ocular myiasis due to a larva of *Oestrus ovis* seen in the Paris region (Vitry) where the condition is rare, although this would seem to be the third case described [see this *Bulletin*, 1922, v. 19, 487]. *H. J. O'D. Burke-Gaffney*

Ranque, J. & Nicoli, R. M. Sur la topographie thoracique des phlébotomes (Nematocera). [**Thoracic Topography of** *Phlebotomus*] *Riv. di Parassit.* Rome. 1954, Oct., v. 15, No. 4, 605–12, 2 figs. [13 refs.]

Garnham, P. C. C. **A Haemogregarine in** *Argas brumpti*. *Riv. di Parassit.* Rome. 1954, Oct., v. 15, No. 4, 425–35, 18 figs. (17 on 2 pls.) [13 refs.]

Deschiens, R., Lamy, L., Levaditi, J., Sénéchal, Françoise & Rist, N. Sur un cas de linguatulose nymphale du cobaye. [**Pentastome Infection in a Guineapig**] *Bull. Soc. Path. Exot.* 1954, v. 47, No. 6, 840–41, 2 figs. on pl.

Cross, H. F. **Feeding Tests with Blood Sucking Mites on Heparinized Blood.** *J. Econom. Entom.* 1954, Dec., v. 47, No. 6, 1154–5.

Bdellonyssus bursa, *B. bacoti*, *B. sylviarum* and *Dermanyssus gallinae* were induced to feed on heparinized blood through a "silk bolting cloth"

forming a membrane between the mites and the blood. After periods of 30 minutes the percentages gorged of, for example, 60 females of *B. bacoti* given the opportunity to feed at 75°, 85° and 95°F. were, respectively, 34·6 per cent., 65 per cent. and 100 per cent. *D. S. Bertram*

Hall, L. B. **Suggested Techniques, Equipment, and Standards for the testing of Hand Insecticide-Spraying Equipment.** *Bull. World Health Organization.* Geneva. 1955, v. 12, No. 3, 371–400, 21 figs.

Knipe, F. W. **Nozzles of Insecticide Sprayers. Comments from the Point of View of Malaria Control.** *Bull. World Health Organization.* Geneva. 1955, v. 12, No. 3, 401–9, 1 fig.

Piédrola Gil, G. & Bravo Oliva, J. Valoración del hexaclorociclo-hexano y del lindane. [**Estimation of BHC and Lindane**] *Med. Colonial.* Madrid. 1955, Mar. 1, v. 25, No. 3, 209–38, 6 figs. [26 refs.]

Haynes, H. L., Guest, H. R., Stansbury, H. A., Sousa, A. A. & Borash, A. J. **Cyclethrin. A New Synthetic Insecticide said to be more readily synergized by the Common Pyrethrins Synergists than Allethrin.** *Soap.* New York. 1955, Feb. & Mar., v. 31, Nos. 2 & 3, 141–3, 147, 151, 160–61; 185, 187, 191, 195, 197, 1 fig.

LABORATORY PROCEDURES

See also p. 537, Lawless, **A Preliminary Report on a Rapid Permanent Mount Stain Technic for the Diagnosis and Recognition of Intestinal Protozoa.**

Blagg, W., Schloegel, E. L., Mansour, N. S. & Khalaf, G .I. **A New Concentration Technic for the Demonstration of Protozoa and Helminth Eggs in Feces.** *Amer. J. Trop. Med. & Hyg.* 1955, Jan., v. 4, No. 1, 23–8.

The merthiolate-iodine-formaldehyde (MIF) stain [see Sapero and Lawless, this *Bulletin*, 1954, v. 51, 311] has been improved by embodying a concentration procedure, as follows. The specimen of faeces is shaken vigorously for 5 seconds with the reagent, and the mixture is strained through 2 layers of wet gauze. Four cc. of ether are added and the mixture is again shaken. After letting the suspension stand for 2 minutes, it is centrifuged for 1 minute at 1,600 revolutions per minute, when 4 layers separate out: (i) ether, (ii) a plug of detritus, (iii) MIF and (iv) sediment containing protozoa and helminth eggs. All but the last are poured off quickly and the sediment is then examined.

One hundred specimens were collected from Egyptians living in a village in the Delta and were examined by the above technique, which was compared with the original MIF stain, brine flotation, zinc-sulphate flotation,

formalin-ether sedimentation and acid-ether sedimentation methods. The new technique was superior to any of the others, *e.g.*, for protozoa it detected 74 per cent. trophozoites and 92 per cent. cysts compared with 55 per cent. and 58 per cent. respectively by the old MIF method. For helminths it was just as superior: 86 per cent. ova were found by the new technique, and half or less this percentage by any of the others. Nine species of helminths and 10 protozoa were identified during the survey.

P. C. C. Garnham

See also p. 490, Vermeil, *Gerbillus hirtipes* Lataste, nouveau rongeur de laboratoire. [*Gerbillus hirtipes* **as a New Laboratory Rodent**]

MISCELLANEOUS PAPERS

Hinman, E. H. **Public Health and Preventive Medicine in Tropical America.** *Southern Med. J.* 1955, Jan., v. 48, No. 1, 54–63, 1 chart. [30 refs.]

This is a review of the achievements and present state of public health in Puerto Rico in particular and tropical America in general. A variety of communicable diseases are discussed briefly and in almost all of them great advances in control are reported. In the case of yellow fever, jungle infections are still not infrequent owing to the difficulties of organizing control in rural areas. Tuberculosis has become one of the most important " tropical diseases " as a consequence of socio-economic factors; mortality from this cause has been dramatically reduced in some of the countries mentioned but it is doubtful if morbidity will decrease similarly. Hookworm infection still remains clinically important over large areas.

In Puerto Rico the population age structure now resembles that of the United States of America two decades ago. The mortality rate in 1953 was below that of the United States, 8·1 as compared with 9·6. The principal causes of death in the two countries had been very different, but striking changes occurred between 1948 and 1953 in the proportion of deaths due to different diseases, and in 1953 heart disease replaced intestinal disorders as the main cause of death in Puerto Rico. Whereas control of communicable disease was brought about by community action through environmental sanitation and immunization, the degenerative diseases of the older age-groups, which are associated with advancing technological development, will only be controlled by initiative and effort on the part of the individual.

T. H. Davey

Kilborn, L. G. **Observations concerning some Racial Characteristics (Blood Pressure and Basal Metabolism) in West China.** *Proc. Alumni Ass. Malaya.* 1954, Dec., v. 7, No. 4, 248–56, 6 figs. [32 refs.]

Between 1930 and 1937 the author published a series of papers in the *Chinese Medical Journal* and *Chinese Journal of Physiology*, in which he recorded that in certain aboriginal tribes in West China the arterial blood pressure of the older age-groups remains stationary or shows a tendency to decrease and that the basal metabolism of one group had an average deviation of 15·8 per cent. above the Harris and Benedict standards. The present paper is the text of a lecture, in which he discusses whether these deviations from Western physiological standards are determined by genetic

or environmental factors and whether or not they are biologically advantageous. Not surprisingly no definite answer was given to either of the two questions, but, as the author says, " no harm is done by occasionally sitting back and meditating upon the possible wider implications of some of the facts that are dug up in the laboratory ". Dr. Kilborn's meditations certainly make interesting reading. *R. Passmore*

Riv. di Parassit. Rome. 1954, Oct., v. 15, No. 4, 177–240, 1 pl. Lo spirito scientifico e l'opera parassitologica di Battista Grassi. [a] Lo spirito scientifico di Battista Grassi [Cotronei, G. (177–89)]. [b] L'opera protozoologica di Battista Grassi alla luce degli odierni sviluppi della scienza [Corradetti, A. (190–99)]. [c] L'opera elmintologica di Battista Grassi [Biocca, E. (200–214)]. [d] Gli studi entomologici di Battista Grassi [La Face, Lidia (214–40)]. [**The Scientific Spirit and Parasitological Work of Battista Grassi and his Contribution to Scientific Progress**]

REPORTS AND SURVEYS

India, Govt. of: Ministry of Health. Directorate General of Health Services [Lakshmanan, C. K., Director General]. **Health Atlas of India.** 54 pp., numerous charts & maps. 1953. [Rs. 4; 6s. 6d.]

This is a collection of maps, reproduced as black-and-white line drawings with shading and stippling to show different degrees of the conditions displayed. The maps show population, births and deaths (1952); distribution of deaths from cholera (1949), smallpox (1949), plague (1949), dysentery and diarrhoea (1949); endemicity of malaria; agricultural and climatic regions in relation to malaria vectors; distribution of filariasis; probable distribution of leprosy; and the numbers of hospital beds per 100,000 of the population. Interspersed between the maps are histograms and diagrams indicating birth and death rates and rate of population increase compared with the rates in other countries; seasonal variations in the death rates from cholera, smallpox, plague, and dysentery and diarrhoea in the various States; the numbers of doctors; and expenditure on public health. With each map or diagram there are a few paragraphs of explanation.

In his preface Lt. Col. Lakshmanan states that it is hoped to publish a similar atlas each year. [Pictorial representations of this kind have a distinct value, and within the prevailing limits of accuracy a series showing progression from year to year should be most useful.] *Charles Wilcocks*

Lawrie, W. **A Medical Survey on the Kenya Coast Twenty-Five Years Ago.** *East African Med. J.* 1955, Feb., v. 32, No. 2, 51–8.

This is an unusual article in that it is written by the director of a recent survey in an area surveyed 25 years previously and consists of an appraisal of the report of the earlier survey. For the most part the author is able to compliment the earlier workers on their clinical acumen and accurate forecasts although the anti-hookworm campaign which the survey inspired

was only partially successful. The author rightly comments on the great increase in morale which followed the first survey.

[The reviewer, having worked in the same area between the two surveys, would suggest that the lesson to be drawn is to follow a survey with active public health and clinical measures and not to plan a new survey without paying full attention to all the available information locally acquired, whether published or not.] *Frederick J. Wright*

EGERTON, W. S. **An Account of State of Health and Problems of Medical Interest in Goilala, Papua.** *Med. J. Australia.* 1954, Sept. 11, v. 2, No. 11, 444–7.

Little is known about the people of this remote mountainous part of Papua, but there is now a government station, with a small hospital, at Tapini, in the centre of the area. A description is given of the precipitous country, where the people live at altitudes of 4,000 feet or more and where the rainfall reaches 100 inches. The population is about 26,000 and most of them can be reached by the medical officer only after arduous journeys on foot; " it is everyday practice on patrol to climb 1,200 feet per hour for three hours and then descend equally on the other side ". Routine patrols in the district are undertaken from time to time, but otherwise the patients who come to the hospital do so after journeys which may take several days.

The people are primitive, almost untouched by outside influences. They cultivate small gardens cleared on the steep slopes, and the crops include sweet potatoes, pumpkins, cucumbers, taro, yams, maize, tapioca, tomatoes, English potatoes and bananas. All these grow well, and they mature and are eaten in succession, so that the people may be living on one type of food—for example sweet potato—for several months. Protein is scarce, and although pigs are numerous there are strong traditional restrictions against using them for food except on special occasions. Salt intake is very low and in the absence of government supplies of salt the people make a physiological adjustment in diet, taking little water.

As in other primitive communities, houses are dark and badly ventilated; a fire in the middle of the floor fills the house simultaneously with warmth (which is needed) and smoke. The chronic cough which is so common, and the observed susceptibility of the people to respiratory infections, are attributed to smoke and to the sudden changes from warmth inside to cold and wet outside. Sanitary standards are primitive, and the pigs are driven at night into the women's houses.

The common diseases include malaria, lymphogranuloma inguinale, gonorrhoea, yaws, tropical ulcer, respiratory infections, impetigo, tinea, scabies, and bacillary dysentery. The point is made that malaria contracted by labourers on the coast is often a cause of death on their return to high altitudes. In an examination of 1,398 persons in one area, skin diseases were the most common, but no tuberculosis, leprosy or hookworm disease was found. *Charles Wilcocks*

BOOK REVIEWS

Bull. Signalétique D'Entom. Méd. et Vét. Paris. Mimeographed.

This *Bulletin* is comparatively new; it is issued from the Office de la Recherche Scientifique et Technique Outre-Mer, 20 Rue Monsieur, Paris VII, and first appeared in 1954.

It consists of two parts, each reproduced in mimeograph form. Part I comprises a list of titles of papers and books on entomological subjects of medical and veterinary interest, the papers being published in over 200 periodicals from various countries. These are listed under the headings of the journals; there are no abstracts or reviews. In Part II the papers are classified according to subject, typical headings being *Culicidae—Generalités*; *Anophelini et Paludisme*; *Siphonaptères et Maladies Transmises*; and so on. A table of contents at the end is a guide to 28 such sections. The entries in Part II are mimeographed on one side of the paper only, so that they could be cut out and pasted on cards for a card index. All the entries are set out with the usual bibliographical details.

The advertised cost for subscribers in France is 640 frs. for the 5 numbers issued in 1954 and 1,000 frs. for the 6 numbers to be issued in 1955; for subscribers in other countries the prices are 800 and 1,200 Frs., respectively.

Charles Wilcocks

World Health Organization. **Style Manual (Provisional).** Numerous pp. (loose-leaf). [1954. Geneva.]

[This review appeared also in the *Bulletin of Hygiene*, 1955, v. 30, 378.]

The need for clarity of expression and consistency of usage has perhaps never been greater than it is today, and although standardization for its own sake is to be deplored, any attempt at establishing a norm for the ever-growing number of international publications with all their accompanying abbreviations and technical terms is welcome. The *Style Manual* is such an attempt. In a categorical, workmanlike way it deals with the problems met in the ordinary course of editing and with the special problems in the editing of papers on medical and allied subjects. It is possible to disagree with it on points of detail but this is inevitable in a book intended for international use. Without the particular charm of the more discursive books on language and its usage, it is nevertheless excellent as a work of reference and has a useful bibliography which is, however, somewhat buried in the text.

The manual was written primarily for the use of WHO editors but would be of great assistance to all writers in the field of medicine. Unfortunately the book is not for sale although a limited number of copies is available for medical and publishing organizations willing to examine it critically and make suggestions for its improvement.

John Rathborn

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